TIDE TABLES

FOR THE

BRITISH AND IRISH PORTS,

FOR THE YEAR

1899:

ALSO THE TIMES AND HEIGHTS OF HIGH WATER AT FULL AND CHANGE
FOR THE PRINCIPAL PLACES ON THE GLOBE.

By CAPTAINS H. R. HARRIS, R.N., AND W. N. GOALEN, R.N.

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NOTICE.

IF it be desired to reduce the Mean time at any place to that of Greenwich (or Railway) time, the following correction must be applied to the time given in these Tables :—

					Minutes.
Brest	-	-	-	+	18
Devonport	-	-	-	+	17
Portsmouth	-	-	-	+	4
Dover	-	-	-	—	5
Sheerness	-	-	-	—	3
Chatham	-	-	-	—	2
Harwich	-	-	-	—	5
Hull -	-	-	-	+	1
Sunderland	-	-	-	+	5
North Shields	-	-	-	+	6
Leith	-	-	-	+	13
Thurso	-	-	-	+	14
Greenock	-	-	-	+	19
Liverpool	-	-	-	+	12
Pembroke	-	-	-	+	20
Portishead	-	-	-	+	11
Holyhead	-	-	-	+	18

For the Irish ports, should Dublin Mean time be required, the following correction must be applied to the time given in these Tables :—

					Minutes.
Kingstown	-	-	-	—	1
Belfast	-	-	-	—	2
Londonderry	-	-	-	+	4
Sligo -	-	-	-	+	9
Galway	-	-	-	+	11
Queenstown	-	-	-	+	8
Waterford	-	-	-	+	3

The above corrections are also given at the foot of each page under the place for which the times and heights of high water are predicted.

PREFACE.

In the following Tables the time of high water is given in *Mean* time at place. Those who are desirous of knowing the *Apparent* time (or that shown by the sun) at which high water occurs, must apply the equation of time, by addition or subtraction, as directed for that purpose.

The height of the tide in these tables is calculated from the mean level of the low water of ordinary springs, because the soundings expressed in most charts are reduced to that level. The height, therefore, which is given at each place is the actual rise of high water above the mean low water level of spring tides.

In the column of the moon's transit (m) stands for morning, and (a) for afternoon.

The moon's age is given in days, and tenths of a day, from the time of her conjunction, or change; thus, it is New moon on one day, at 2 h. 18 m. in the afternoon, and on the next day at noon, the moon being 21 h. 42 m. old, her age may be accounted as nearly one day, and is expressed by 0·9.

The highest tides take place on the west coast of Ireland and on the south coast of England, three transits after the New and Full moon, unless diverted by gales of wind or other extraordinary causes. Along the east coast of England, they take place four transits after the New and Full moon. In the river Thames they occur five transits after the same epoch. These differences arise from the fact, that the same tide wave which produces high water on the west coast of Ireland takes half a day in its progress thence to the east coast of England, and a whole day before it arrives in the river Thames.

The time of high water at Brest is added for the benefit of vessels navigating along the north coast of France and adjacent sea.

Immediately after the Tide Tables, at page 98, will be found a convenient method of deducing, from them, the height of the tide at any intermediate hour, between high and low water.

At page 101 will be found a collection of Tidal constants, by which the time and height of high water at certain other ports may be *approximately* found.

At pages 106–166 a description is given of the general set of the tides around Great Britain and Ireland, and in the North sea.

Lastly, there is appended for various places on the globe, arranged according to the apparent progress of the tide wave, as well as alphabetically, the time of high water on the days of full and change; with the rise of the tide at springs and neaps.

The stations at the several ports where the tidal observations were made on which the predictions in these tables are based, are as follows,—viz. :—

Brest, entrance of the basin—Devonport, dockyard—Portsmouth, dockyard—Dover, North pier—Chatham, dockyard—Sheerness, dockyard—London docks (reduced to London bridge, the latter being given in these tables, by applying to the times at the docks + 5ᵐ)—Harwich, Angel quay—Hull, Victoria dock—Sunderland, North dock—North Shields, Low lighthouse—Leith, East pier—Thurso, near Scrabster pier—Greenock, East dock—Liverpool, George pier—Pembroke, dockyard—Portishead, dock entrance—Holyhead, pier—Kingstown, Watering pier—Belfast, New dock—Londonderry, Ship bridge—Sligo Bay, Mullaghmore—Galway, Nimmo pier—Queenstown, Scott's wharf—Waterford, Duncannon fort.

The following diagram is intended to explain the terms Spring rise, Neap rise, and Neap range as made use of on the Admiralty charts and in the Sailing Directions published by the Admiralty:—

Tide Gauge.
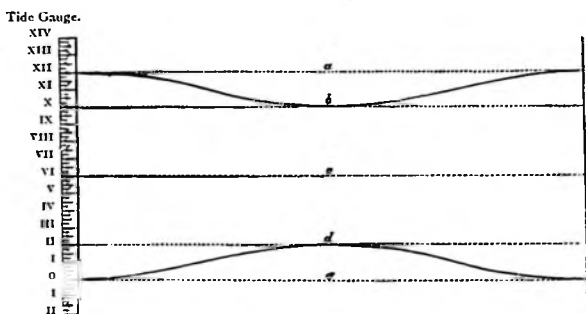
a = Mean level of high water ordinary Springs.
b = ,, ,, ,, , Neaps.
c = Half tide or mean level of the sea both at Springs and Neaps.
d = Mean level of low water ordinary Neaps.
e = ,, ,, ,, ,, Springs.

Example.

				ft.
Spring rise (or mean Spring range)	= e to a	= 12
Neap rise	,,	,,	,,	= e to b = 10
Neap range	,,	,,	,,	= d to b = 8

Since at places where there is a large diurnal inequality, the water often falls considerably below the true mean of the low water levels at spring tides, it has been decided that the datum generally in use for charts, viz.—the level of low water ordinary spring tides, shall be considered to be equivalent in the Harmonic Notation to the sum of the semiranges of the principal lunar (M_2), principal solar (S_2), semidiurnal tides, and of the luni-solar diurnal (K_1) and the lunar-diurnal (O_1) tides below the mean sea-level; that is to say,

$$A_0 - \{H \text{ of } M_2 + H \text{ of } S_2 + H \text{ of } K_1 + H \text{ of } O_1\}$$

above the zero of the tide gauge.

A_0 is the height of mean sea level with reference to the zero of the tide gauge.
H ,, the height, or semirange.
M_2 ,, the principal lunar semidiurnal tide.
S_2 ,, the principal solar semidiurnal tide.
K_1 ,, the luni-solar diurnal tide.
O_1 ,, the lunar diurnal tide.

TREATISE ON TIDES.

By the Rev. Dr. Whewell.

1. In making tide observations, the main object is, in the first place, to refer the tides to the motions of the *moon*, by which they are, in most places, mainly governed.

For this purpose, the *time* and *height* of *high water* (and of *low water*) at each place must be obtained ; and this *time* will have to be compared with the *time* of the moon's passage across the meridian of the place.

The latter time (the *time of the moon's transit*) may be known by the common table given in the Nautical Almanac, or in other books of the same kind.

2. The time of high water (and low water) may sometimes (when the sea is calm) be ascertained with sufficient accuracy by observing the surface of the sea, where it washes a vertical scale fixed in the open water and divided into feet and inches. The moment when the water is highest (and lowest) must be observed by a watch or clock, well regulated or corrected for its error.

3. In general, the waves will make it difficult to observe the moment of the highest (and lowest) open water with much accuracy. The following methods may be used to make the observations more accurate :—An upright tube, open below and above, may be placed in the water, reaching above the high water and below the low water (or two tubes, one for high water and one for low water, if this mode be more convenient). In this tube must be a float (a hollow box or ball, for example), which must carry an upright rod, or else must have attached to it a string which passes upwards over a pulley and is stretched by a weight ; and the part of the rod or of the string which is outside the tube must carry an index, which shall mark on a vertical fixed scale the rise and fall of the float.

By making the tube close below, except one or more small openings, the motion of the waves will very little affect the float, and the true rise and fall of the surface may be observed with much accuracy.

4. It may happen that the moment of the highest or lowest water is difficult to determine, either with or without the tube, on account of the water, while near the highest or lowest, stopping or hanging still, without either rising or falling, or else rising and falling irregularly.

If there is a considerable time during which the water neither rises nor falls decidedly, note the moment when it ceases to rise, and the moment when it begins to fall, and take the time half way between these for the time of high water.

5. Another method is the following :—At certain intervals of time near the time of high water, for example, every ten minutes, or every five minutes, let the height of high water be observed, say for half an hour or an hour, and from the height so observed pick out the highest for the high water, and note the height and the time ; and in like manner for low water.

6. But the following is a better mode of dealing with observations thus made every five or ten minutes. Let a number of vertical parallel lines *(ordinates)* be drawn at intervals, corresponding to the intervals of observations, and bounded by a horizontal line perpendicular to them (the line of *abscissæ*), and on these lines (the ordinates) let the observed heights of the surface be set off, and let a line be drawn through their extremities. This line, if it be tolerably regular, will give the time of high water ; and if it be somewhat

irregular. it can be smoothed into a curve, and then the time and height of high water read off. And in like manner for low water.

Suppose, for example, that we have the following observations of the height of the water made every five minutes for an hour:—

Times of Observation ...	h. 0 m. 0	m. 5	m. 10	m. 15	m. 20	m. 25	m. 30	m. 35	m. 40	m. 45	m. 50	m. 55	m. 60
Heights observed ... { ft.	6	6	6	6	6	6	7	6	6	6	6	6	5
{ in.	0	6	6	9	10	11	0	11	11	9	5	2	10

The selection of the greatest height (as in 5) would give high water at 0 h. 30 m.; but the general run of the height (6) would give the high water two or three minutes later, as appears by drawing the dotted curve in fig. 1.

This way of finding the exact time of high water (or low water) from observations made every five or every ten minutes, between some of which the highest water happens, is called "interpolating." Thus, supposing that we have the following observations, made at intervals of 10 minutes:—

	Time. h. m.	Height. ft. in.
P.M.	6 20	44 3
	6 30	45 2
	6 40	45 2
	6 50	44 8
	7 0	44 0

By interpolation from these observations, we find, for the exact moment of high water—

	Time. h. m.	Height. ft. in.
	6 38	45 3

7. It is easy to draw such curves, if we have, ready prepared, *paper ruled*

Fig. 1.
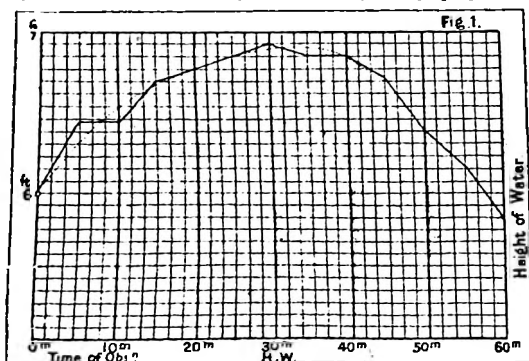
into small squares, the divisions in the horizontal line representing hours and minutes, and the divisions in the vertical line representing feet and inches.*

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* Paper thus ruled can readily be procured from ordinary stationers.

8. It is well to begin a series of tide observations at any place by observing the height of the water, during the *whole of the day and night*, every half-hour or every quarter of an hour. For if the rise and fall be very irregular, or have any features which make it differ much from the common rule, it will, by this means, be seen that the case is a peculiar one, and that peculiar methods must be used : but if there is nothing peculiar in the case the common methods may be used.

For instance, if there is a large diurnal inequality, or if, instead of there being two tides in every lunar day, there be one only, or four (both which cases occur at several places), these peculiarities will be discovered by observations continued during the day and night, in the way just recommended. If there be a periodical rise and fall of the sea's surface not depending in any obvious way upon the moon, the periods of maximum and minimum should be carefully and exactly observed, in order to determine upon what the rise and fall do depend. This is the case in some parts of the Pacific, the rise and fall at those places being small.

9. If *the tides are tolerably regular*, it will not be necessary to observe, except for every five (or ten) minutes near the time of high water and low water—say, for an hour, so as to include the exact time near the middle of the hour. From these observations, by laying down the heights as ordinates, and drawing curves as directed in (6), the height and time of high water and of low water will be deduced.

10. It is desirable to compare the observations of the time of high water and low water with the time of the moon's transit (see 1) *while the observations are going on* ; for if the tide follow this transit at very irregular intervals, the observations should, if possible, be made at shorter intervals, in order to get the true motion of the water.

11. The time of high water at any place on the day of new or full moon is commonly called the *establishment* of the place ; because, this being established, the time of high water on any other day may, in most cases, be known.

12. But if the tides are very irregular, this is not the case, and then the establishment of the place is of no use, or, rather, there is no proper establishment. And if the tides be regular, the establishment may be got from observations made *on other days*, just as well as from those made on the day of new or full moon. (See Note A.)

13. To compare the times of high water with the times of the moon's transit (see 10), we must take the moon's transit from the tables (see 1), and reckon how much the time of high water is *after* the time of the moon's transit, and put down these intervals, which are called the *lunitidal intervals.**

Suppose, for example, that we have obtained (as in 4, 5, or 6) the observations of high water contained in the following table ; we add to them the other columns, containing the moon's transit and the lunitidal interval calculated therefrom. The alternate transits are interpolated midway between the others, which are given by the table in the Nautical Almanac. The A.M. transit

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* It is not necessary, for the purposes considered in these directions, to calculate the time of the moon's transit *at the place of observation* by differences of days. It is sufficient to take the time of the moon's transit at Greenwich, and to *add* two minutes for every hour of *west* longitude of the place. For the moon (on the average) moves away from the sun so that her distance from the sun is increased 48 minutes in time for every 24 hours, and therefore the transit of the moon is later at every other place by two minutes for every hour. Or, the variation of moon's right ascension in one hour of terrestrial longitude can be taken out from the section of *Moon Culminating Stars* in the Nautical Almanac.

which happens at o h. 32 m. on the 14th is given in that table as 12 h. 32 m. P.M.

1847. Jan.	Time of H.W.		Time of Moon's Transit.		Lunitidal Interval.		1847. Jan.	Time of H.W.		Time of Moon's Transit.		Lunitidal Interval.	
	h.	m.	h.	m.	h.	m.		h.	m.	h.	m.	h.	m.
11 A.M.							16 A.M.	3	54	2	6	1	48
P.M.	1	7	[10	33]	2	34	P.M.	4	9	[2	29]	1	40
12 A.M.	1	29	10	57	2	32	17 A.M.	4	26	2	52	1	34
P.M.	1	51	[11	21]	2	30	P.M.	4	43	[3	15]	1	28
13 A.M.	2	11	11	45	2	26	18 A.M.	5	3	3	39	1	24
P.M.	2	29	[0	9]	2	20	P.M.	5	23	[4	3]	1	20
14 A.M.	2	48	0	32	2	16	19 A.M.	5	46	4	27	1	19
P.M.	3	3	[0	55]	2	8	P.M.	6	9	[4	51]	1	18
15 A.M.	3	21	1	19	2	2	20 A.M.	6	34	5	16	1	18
P.M.	3	36	[1	42]	1	54	P.M.	7	1	[5	41]	1	20

on the 13th, the hour of the table being reckoned from noon in the Nautical Almanac.

In this table, by subtracting [10 h. 33 m.] the time of the [interpolated] moon's transit from 1 h. 7 m., or rather from 13 h. 7 m., the observed time of high water, we get 2 h. 34 m., the lunitidal interval; and so on for the rest.

14. To see whether the lunitidal intervals follow the regular law, the best way is to put them into a curve, setting off the lunitidal interval belonging to each tide as an ordinate, as in fig. 2.*

Fig. 2 represents the lunitidal intervals given in (13).
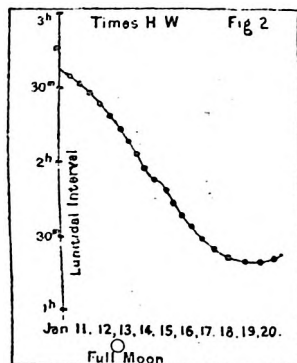
15. In the observations given in (13) we may see how loose a term the "*establishment*" is. The 13th is the day of full moon, for in the course of that day the moon is 12 hours from the sun, as appears by the times of her transit. The time of high water on the 13th is, for A.M., 2 h. 11 m.; for P.M., 2 h. 29 m.; and either of these might, in the common use of the term, be called "the establishment."

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* In actual practice it will be better to draw the figures on a larger scale than those here given.

16. If the lunitidal intervals be set off for a fortnight or more, the curve (14) will descend and ascend alternately every fortnight, as in fig. 3.
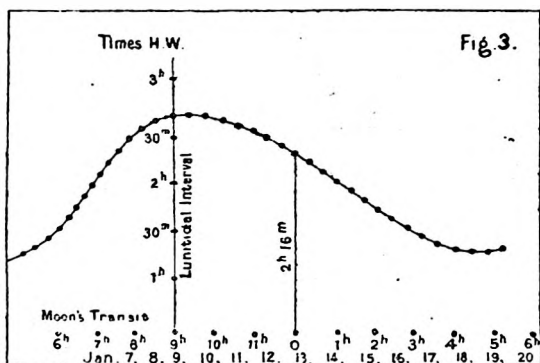
This curve is the curve of the *semi-mensual inequality of time* ; and when this curve has been determined by observations at any place, the hour of high water at any time at that place may be predicted.

17. But the curve will be better determined if, instead of taking for the abscissæ the days of the month, as in fig. 2, we take the times of the moon's transit, as in fig. 3.*

In this case *the establishment* is the ordinate of this curve which corresponds to the time of moon's transit o h. or 12 h. In the figure it is 2 h. 16 m.

The mode of calculating the hour of high water on any day, when the establishment of the place is known, is given in Note A.

The establishment of the place may be known by observations made at any age of the moon, as well as by observations at new and full moon, by the same kind of calculation.

18. In order to determine the *law of the heights of high water* during the period from springs to neaps, we must set off the *heights* of high water as ordinates, and draw a curve through the extremities. This curve also will ascend and descend every fortnight (ascending at spring tides and descending at neap tides).

The heights may be set off as ordinates, taking for the abscissæ equal intervals to represent successive half-days, as in (16).

But the curve will be better determined if we take for the abscissæ the hours of the moon's transit, as in (17).

19. The *maximum* or greatest ordinate of this curve of heights (that is, the spring tide height) follows the day of new and the day of full moon, by one, two, or three days ; and, as the new or full moon is supposed to produce the spring tide, this interval of one, two, or three days is called *the age of the tide*.

20. If the heights be set off from the hours of the moon's transit as abscissæ (see 18), the distance of the maximum ordinate from the hour of transit, o h. or 12 h. (which are the same thing), will give the *age of the tide* more exactly than the process in (19).

21. The lunitidal intervals and heights of *low water* may be laid down in curves in the same manner as those of high water.

---

* Since the moon's transit is about 48 minutes later every day, there will be along the line of abscissæ five days of the month for every four hours of difference of time of moon's transit.

22. The curve of the semi-mensual inequality of times and heights should be determined, when opportunity allows, for several weeks or months in succession; for from such observations we can, in some cases, obtain other scientific results (the effect of the sun, the effect of the moon's parallax, and the like).

23. Besides the changes which are produced from day to day by the semi-mensual inequality of times and heights, there are at most places other considerable changes produced between the two tides of the same day by the *diurnal inequality.*

For example, there are many cases in which the height of high water is alternately lower and higher in successive tides.

24. In this case, if we set off the successive heights of high water as ordinates at equal intervals of time, and draw a line through their extremities, as directed in (18), this line will have a zigzag form, as in fig. 4.

The width of the zigzag increases from nothing to a maximum, and then diminishes to nothing again, generally in the course of a fortnight; and so on perpetually.

25. In consequence of the diurnal inequality, it sometimes happens that the day tides are higher than the night tides, or the reverse, for many months together. And hence it has sometimes been stated as a rule at such places that the day tides are always the highest, or the reverse. But this is not the rule. If the day tides are the highest at one time of the year, they are the lowest at another.

The diurnal inequality depends mainly on the moon's declination, but no simple rule can be given to calculate it or to apply it when calculated, as other factors are, in some localities, of such magnitude as to greatly complicate the result. The general law appears to be that when latitude and the sun's declination are of the same name, the day tides are the highest, and when of different names the night tides are the highest; or, that in both hemispheres the day tides are the highest in the summer, and the night tides in the winter; but there are exceptions to this.

26. There is often a diurnal inequality of the height of low water, and at some places it is greater than the diurnal inequality of high water (as at Singapore, and at port Essington in Australia).

27. Also there is often a very perceptible diurnal inequality in the times. When this is the case, if we set off the lunitidal intervals as ordinates (see 14), the line drawn through their extremities will have a zigzag form, like that of the heights in fig. 4.

Heights H.W.   Fig. 4

Height H W

Jan 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17.
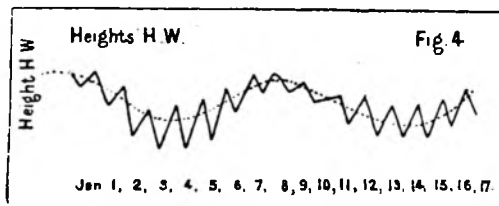
28. When this is the case, we cannot determine *the establishment* (see 17) without making allowance for the diurnal inequality.

We make allowance for the diurnal inequality by drawing a curve, cutting off from the zigzags equal portions above and below. (See fig. 4.) This *mean line* will be of a wavy form, in consequence of the semi-mensual inequality; and the ordinate corresponding to the new or full moon, or to the hour o or 12 of moon's transit, will give the establishment.

But if we apply this establishment to predict the time of tide on any day, we must remember that the diurnal inequality will affect it.

29. The diurnal inequality sometimes becomes so large that there is *only one tide in 24 hours* (and then we have *single day tides*). But this does not generally happen through a whole lunation; it happens only for a few days in each semi-lunation; and at other times there are two tides as usual. Cases of one tide in 24 hours should be particularly observed, making the observations every half-hour, or, if possible, oftener—say every five minutes.

30. In some places the tide rises and falls *four times* in the 24 hours. The cases where this occurs are to be particularly observed.

They may be observed, as in (29), by making observations every half-hour, 10 minutes, or 5 minutes.

These may be called *double half day tides*.

31. Where double half day tides exist, they do not commonly extend over any considerable length of coast. If there be time and opportunity, it will be well to examine, by observation, how far they do extend. But if the object be to determine the laws of the tides in a larger area, it is better to make the observations out of the region of these anomalies.

32. It is well to observe the *direction* of the stream of flood and of ebb, and the *time* at which the stream turns.

We must take care not to confound the time of the *turn of the tide stream* with the time of high water. Mistakes and errors have often been produced in tide observations by supposing that the turn of the tide stream is the time of high water. But this is not so. The turn of the stream generally takes place at a different time from high water, except at the head of a bay or creek. The stream of flood commonly runs for some time, often for hours, after the time of high water. In the same way, the stream of ebb runs for some time after low water.

33. The time at which the stream turns is often different at different distances from the shore; but the time of high water is not necessarily different at these points. Thus the time of *slack water* is not wanted for a theory of tides, though its knowledge is in other respects of considerable importance to the seaman.

In the centre of all open channels when the tide runs right through, the streams nearly invariably overrun the times of high and low water by about three hours. In such a locality the stream due to the flood will commence three hours before high water and continue to run for three hours after high water in the same direction.

In tidal rivers a modified form of the same phenomenon occurs, *i.e.*, the stream runs up for some time after the water has begun to fall, and runs down after the water has begun to rise.

Near the sides of a channel of any width, and whose sides are shallow, near the direction of the tidal stream is rotatory. On the left hand, looking up the channel with the flood stream, the direction of the rotation is with the hands of a watch; and on the right hand side, in the contrary direction, in the following manner. At low water the stream will be running down the channel; at half tide it will be flowing towards the shore; at high water it will be running up channel parallel to the shore; and at half ebb it will be ebbing directly away from the shore.

In the upper parts of estuaries or tidal rivers, where shallow water prevails, the duration of the flood stream is commonly shorter than that of the ebb.

The higher up the estuary the greater will this difference become. This is apparently due to the retardation of the advancing tide caused by friction over the shoals, and when the range of tide is great the water becomes heaped in the

lower part of the estuary, finally rushing up the higher part in a wave which, in extreme instances, has a more or less vertical face, and is called a "*bore.*"* In such a case the tide rises perhaps half its height in a few minutes, and the whole duration of flood stream will be confined to two or three hours, or even less; the remainder of the twelve hours being occupied by the downward or ebb stream.

34. One important object to be answered by means of tide observations is to trace the progress of the tide from one place to another.

This may be done in some measure by determining the *establishments* of a series of places in the region which we have to consider. For these establishments, reduced to Greenwich time by allowing for the longitude, give the time at which the tide is at each place, and hence its progress.

35. The progress of the tide may be conceived as the progress of a very wide *wave* which brings the high water to each place in succession.

But the motion of this tide wave is not that motion of the water which makes the stream of flood. Nor does the motion of the wave coincide with any motion of the parts of the water. The tide wave may be going one way when the water is going another, as already mentioned.

36. The *establishment*, which is wanted in order to determine the progress of the tide wave (see 34 and 35), may be known from observations made at any age of the moon, as well as at new or full moon. (See 17 and Note A.)

37. In tracing the progress of the tide wave, instead of using the *vulgar establishment* hitherto spoken of, it is better to use the *mean establishment*, namely, the mean of all the lunitidal intervals.

For the vulgar establishment is affected by the age of the tide (20), which the mean establishment is not.

The mean establishment is (say) 10 m., 20 m., 30 m., or 40 m. less than the vulgar establishment, according to the age of the tide. (See Note A.)

38. When the tides are regular, good observations, made for a few days or a week at each place, may give the establishment (either vulgar or mean) with sufficient exactness to determine the progress of the tide wave.

39. But the progress of the tide wave may be much better determined by means of *simultaneous observations*, namely, observations made at different places on the same days for a few days or a week.

For such a purpose persons must be posted at different points of the shore or shores where the motion of the tide wave is to be traced : say 10, or 20, or 40, or 80 miles from each other, as may be convenient. They must observe the tides at these places *on the same days*, morning and evening, by the methods already described. The times of high water at the different places on each halfday, being compared, will give the progress of the tide wave.

40. In order to trace the progress of the tide wave still more widely, the observers described in (39) after having made the observations there spoken of, may be removed to new positions of the same kind, and thus trace the tide farther.

When this course is adopted, it will be well to have one (or more) fixed or standard station, at which tide observations are constantly made; and the observations made at any time at any other place may be compared with those made at the standard station.

41. The tides which take place far up deep bays, sounds, and rivers, are *later* than the tides at the entrance of such inlets, but they are not more irregular ; on the contrary, the tides in such situations are often remarkably *regular*.

42. The progress of the tide wave up inlets may be determined by the method described in (39).

* The Tsien tang kiang, Amazon, Seine, and Severn, are cases in point.

43. The tide in its progress up inlets and rivers is often much magnified and modified by local circumstances. For instance, when a gulf or estuary is funnel shaped, and in the same direction as the course of the tide wave, the height of the tide is much augmented, as the body of water is forcibly contracted in its advance; but the maximum rise is at some point short of the end of the funnel in most cases.

Sometimes the tide is divided into two half day tides in its progress up a river (as in the Forth, in Scotland).

In all cases, after a certain point, the tide dies away in ascending a river.

44. The tide observations made at any place, when the times and heights of high water (and of low water) have been deduced in the way directed in (2), (3), (4), (5), (6), may be entered in a table of which the form will be given (Note B), and must then be sent to the Hydrographic Office at the Admiralty.

45. It is to be remarked that, though there is generally an A.M. and a P.M. tide, there is one day in every half lunation on which there is only one tide.

(Because the interval of the two tides is, on the average, about 12 h. 24 m.; so that if there be a tide at 11 h. 50 m. A.M., there will be no other tide till 12 h. 14 m. P.M., that is 0 h. 14 m. A.M. of the next day.)

46. *Self registering tide gauges* are now becoming more common, but their expense prevents their general use. They are constructed so as to work with a tube and float, as described in (3). These machines give the whole course of rise and fall of the tide.

47. The wind often produces a considerable effect upon the tides, especially upon the height, and should be noted, although it is difficult to give any general rule for the effect.

48. The surface of the sea rises and falls as the barometer falls and rises: namely, about 1 inch for every $\frac{1}{30}$ inch of mercury. This may be applied as a correction when very exact observations are made.*

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* Naval officers will be in a better condition to judge of the value of carefully made observations in bringing to perfection the theory of the tides, after reading the practical part of the invaluable article by Sir George B. Airy, K.C.B., in the " Ency. Metrop." before referred to. References are there made to the researches of Dr. Whewell and Sir John Lubbock, printed in the "Phil. Trans." Sir John Lubbock's researches are contained chiefly in the "Phil. Trans." for 1831 and 1833, while those of Dr. Whewell, consisting of fourteen distinct memoirs, extend from the year 1833 to 1850. In the "Phil. Trans." for 1845 is a very valuable paper, by Sir George B. Airy, K.C.B., on the " Laws of the Tides on the Coasts of Ireland "; and in the volumes for 1848 and 1851 are two papers by the late Admiral Beechey on the Tides in the Irish Sea and the North Sea and English Channel respectively. Some valuable observations on the Tides in the North Sea, by Captain Hewett, R.N., will be found in the Report of the eleventh meeting of the British Association.—(R. M. 1859.)

APPENDIX No. 1.

NOTE (A).

NOTE TO 12, 17, 36, AND 37.

To find the hour of High Water on any day, at any place, when the Establishment of the Place is known.

THE rule is different (as to amount) according to the *tidal force* of the sun; for though the tidal force of the sun in theory is the same at all places, it is found by observation to be different at different places.

This difference appears in the different ratio of the rise of spring tides to the rise of neap tides (the semi-mensual inequality of heights). In general the rise of spring tide above mean water is about double that of neap tide, which gives the solar tide *one-third* of the lunar tide. But in some cases the spring tide exceeds the neap tide only by one-third, which gives the solar tide only *one-seventh* of the lunar tide.

Also the difference of the greatest and least lunitidal intervals, that is, the semi-mensual inequality of the times (*see* 13 and 16), shows the difference of the solar tidal force at different places. The difference of the greatest and least intervals is 1 h. 28 m. at London and Liverpool, but at Plymouth it is 1 h. 36 m., and at Portsmouth 1 h. 21 m. On the coast of North America it is generally less than 1 h. 20 m., while at some places on the coasts of France and Ireland it is above 2 h.

We may take 1 h. 28 m. as the mean value of this difference, which agrees with the supposition that the solar tide is about one-third the lunar tide.

In finding the hour of high water on any day when the *vulgar* establishment is known, the rule will also be different according to the age of the tide. We shall give the rule when the tide is a day and a quarter old, and also when the tide is two days and a half old. In general, the tides will be between these limits.

(1) *Tide a day and a quarter old.* Minutes to be added to or subtracted from the establishments, according to the hour of the moon's transit on the half day in question :—

Hour of the Moon's Transit after Sun	h. 0	h. 1	h. 2	h. 3	h. 4	h. 5	h. 6	h. 7	h. 8	h. 9	h. 10	h. 11
Correction of the vulgar Establishment to find the Lunitidal Interval	m. 0	m. −16	m. −32	m. −47	m. −57	m. −60	m. −47	m. −16	m. +15	m. +28	m. +25	m. +15

For example—if the establishment be 2 h. 27 m., at what hour will the high water come after a moon's transit which takes place at 4 h. A.M. ? The minutes

to be added to 2 h. 27 m. for 4 h. transit are, by the table – 57 m., that is 57 m. to be subtracted; therefore the high water will be at 1 h. 30 m. after the moon's transit, that is, at 5 h. 30 m.

(2) *Tide two days and a half old :––*

Hour of Moon's Transit - -	h. 0	h. 1	h. 2	h. 3	h. 4	h. 5	h. 6	h. 7	h. 8	h. 9	h. 10	h. 11
Correction of the Establishment -	m. 0	m. −15	m. −31	m. −47	m. −62	m. −72	m. −75	m. −62	m. −31	m. 0	m. +13	m. +10

This table to be used in the same way as the other.

Hence we see that the age of the tide most affects the lunitidal interval when the time of moon's transit is between 7 and 8 hours.[*]

The mean lunitidal interval, or *mean establishment*, is 16 minutes less than the former, and 31 minutes less than the latter (vulgar) establishment supposed in the above tables. (*See* 37.)

If the tides are observed for a semilunation, or any complete number of semilunations, the mean lunitidal interval, or mean establishment (*see* 37), will be found by taking the mean of all the lunitidal intervals observed.

The lunitidal interval *corresponding to* any given ·distance of the moon from the sun may be found by the following table. But the tide corresponding to the given distance may not really *occur* till one, two, or three days later according to the age of the tide.

(3) Correction of *mean* establishment.

Hour of Moon's Transit (1, 2, 3 days preceding) -	h. 0	h. 1	h. 2	h. 3	h. 4	h. 5	h. 6	h. 7	h. 8	h. 9	h. 10	h. 11
Corresponding Correction of Mean Lunitidal distance	m. 0	m. −16	m. −31	m. −41	m. −44	m. −31	m. 0	m. +31	m. +44	m. +41	m. +31	m. +16

This table may be used when we know the age of the tide. Thus, let the age of the tide be a day and a quarter, and the mean lunitidal interval 2 h. 11 m.; let the moon's transit take place at 4 h.; then at the *birth of the tide*, a day and a quarter earlier, the transit took place at 3 h.; therefore the correction of the lunitidal interval is, by the table, – 41 m., and the interval so corrected is 1 h. 30 m., which, added to 4 h., the time of moon's transit, gives 5 h. 30 m. as the time of high water.

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[*] Hence it is desirable to make tide observations in the first and fourth quarters of the moon rather than in the second and third quarters.

To find the Establishment at any Place when the Hour of High Water on a given Day is observed.

On the given day the time of moon's transit is known, and hence the lunitidal interval; and, by the above tables, the correction by which this differs from the establishment is known.

Thus, if high water occurs at 5 o'clock when the time of moon's transit is 3 h., the lunitidal interval is 2 h.; and the correction (if the first table be applicable) is – 47 m.; hence the establishment is 2 h. 47 m.

NOTE (B).

FORM FOR TIDE OBSERVATIONS.

Tides observed at	, *Lat.* , *Long.* , *by*

Mode of observation . . $\begin{cases} \text{Fixed scale in open water ?} \\ \text{Tube with float ?} \\ \text{Self registering gauge ?} \end{cases}$

Mode of deducing H.W. and L.W. $\begin{cases} \text{Mere looking ?} \\ \text{Ordinates every 5 m. near max. ?} \end{cases}$

18 .		High Water.		Low Water.		Wind.	Barom.	Moon's* Transit.	Lunitidal* Interval. H.W.
Month and Day.	Hour.	Height.	Time.	Height.	Time.				
	1 A.M.								
	P.M.								
	2 A.M.								
	P.M.								
	3 A.M.								
	P.M.								

ADDITIONAL REMARKS.

The general progress of the tide wave along even the most frequented shores is still imperfectly known; and, about the connection of the tides over the general areas of large oceans we are as yet entirely in the dark; there is therefore an ample field of important and useful discovery in this subject, even by means of brief and scattered series of observations; still more is this the case if simultaneous or connected observations can be made, *see* page xiv.

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* These columns to be filled at leisure (*see* pages ix, x).

The main general features of the progress of the tides, as hitherto ascertained, are the following :—

The tide wave which brings the tides to the coasts of Europe comes from the Atlantic, and brings high water to the western coast of Spain and Portugal about 2 hours after the moon's transit ; to the western coast of France about 3 hours ; to the western coast of Ireland and to the Land's End about 4 hours. The tide wave then runs along the south coast of England, and the north coast of France, to the strait of Dover, which it reaches about 11 hours after the moon's transit. It also runs along the west coast of Ireland and Scotland, and reaches the Orkneys about 9 hours after the moon's transit. From thence it enters the German ocean, and runs along the east coast of Britain, so as to reach Peterhead about 12 hours after the moon's transit, and Harwich in about 12 hours more, where it meets the tide wave which had come through the strait of Dover derived from the same Atlantic wave about 12 hours earlier. The tides of the German ocean are produced by the mixture of these two tide waves, and hence follow complicated laws : as for the same reason do those of the Irish channel.

The tide wave which brings the tides to the eastern coast of North America appears to reach the southern parts about 7 hours, and the northern parts of the United States about 11 hours, after the moon's transit ; but its course has not yet been distinctly traced.

How the tides on the eastern and on the western shores of the Atlantic are connected has not yet been clearly shown. It is difficult to explain the tides of the Atlantic islands (Madeira, Teneriffe, &c.) by the simple form of a tide wave.

It is remarkable that the European tide wave, though following the moon's transit at a definite interval (nearly), moves (at first) in a direction opposite to the moon namely, from west to east.

If we go to the Pacific we find the same phenomenon. The tides on the western shore of South America, near cape Horn, also move from west to east. They are simultaneous with the moon's transit at Chiloe ; 1 hour after at cape Pillar ; and at cape Horn it is $3\frac{1}{2}$ hours later than this.

Along a large portion of the east shore of the Pacific it seems difficult to say whether the tide wave travels northward or southward. From the isthmus of Panama, however, it appears plainly to travel to the northward, occupying about 9 hours to run from Realejo to Nootka sound.

In the western parts of the Pacific the tide wave runs to the westward, as we learn by its progress along the coasts of New Zealand and Australia, where the movement is better known than on any coasts out of Europe. It visits New Zealand about 6 hours, and Australia about 10 hours, after the moon's transit *at Greenwich*.

In the central parts of the Pacific the tides are small and anomalous (for they do not clearly depend on the moon), and hence it is still more difficult to connect the *littoral* tides than in the Atlantic ocean.

The outer regions of the Pacific, broken by large islands, and the Indian ocean, have tides, of which the laws of progress are more complex, and have not yet been disentangled.

The Diurnal Inequality (23, &c.) adds to the complexity of the tides. This inequality appears very conspicuously in the tides on the west coasts of Europe and the east coasts of North America ; but its maximum in those two regions does not appear to be simultaneous. It is very large in the Indian ocean and on the coast of Australia, having different phenomena at different places, as noted in 26 and 27.

The movement of the tide along the surface of the ocean may be in some measure represented in the following manner : Draw lines through all the

places where it is high water at the same time; that is, one line (generally it will be a curved line) through all the places where it is high water at *One* o'clock : another line through all the places where it is high water at *Two* o'clock ; and so on. These lines, being the lines at which the tide is contemporaneous, are called *cotidal* lines. They represent the form of the *tide wave* which carries the tide from one point of the shore to another.

Such cotidal lines have been drawn in the "Phil. Trans." for 1833 and 1836, by Dr. Whewell, for those shores on which the tides are best known, and especially for the *coasts* of Europe.

But it appears that we cannot, by means of such cotidal lines, express the movement of the tides in oceanic spaces. The cotidal lines can only be drawn in the neighbourhood of *coasts*. ("Phil. Trans." 1848. Part I.)

*** The best way to disentangle the phenomena of the tides when we are observing them at any place is to refer the time of high water and low water to the time of moon's transit ; and to do this *at once*, while the series of observations are going on. For want of following this rule, it has very often happened that long series of tide observations have been made which could not be turned to any use afterwards ; and in almost every case the usefulness of such observations is by this method much increased, and the labour much diminished.

APPENDIX No. 2.

SINCE the preceding Appendix was published in 1859 a great deal has been done by observation to advance our knowledge of the tides at many ports and stations, both at home and abroad, but there are perhaps few physical subjects which are still at the present time on the whole more unsatisfactory. The editor therefore thinks it desirable to supplement Dr. Whewell's article with notices of such works and memoirs as he has been able to refer to, and which may be easily accessible to students, naval officers, and travellers who may desire to pursue the subject practically, with proper regard to the present defects of our knowledge.

In the "Philosophical Transactions" (which will be denoted simply by the years) will be found the following valuable papers :—

1854. "On the Effect of the Pressure of the Atmosphere on the Mean Level of the Ocean." By Captain Sir James Clark Ross, R.N.

Of this memoir Sir William Thomson says that "probably the best personal observations which have been made on the tides are those herein described."

1863. "On the Tides of the Arctic Seas ; Parts I. and II." By the Rev. Samuel Haughton, M.D., F.R.S.

In this paper the author states that, by carefully laying down the daily high and low waters, he has succeeded in completely separating the diurnal from the semi-diurnal tide, and in resolving each tide into the portions due respectively to the action of the Sun and of the Moon.

The observations discussed are those of Sir James Clark Ross, and discussed by himself in the memoir quoted above. They were made during the time that his ships, the "Enterprise" and "Investigator," were detained in the ice at Port Leopold in latitude $74°$ N., and longitude $91°$ W.

1866. "On the Tides of the Arctic Seas ; Part III. On the Semi-diurnal Tides of Fredericksdal, near Cape Farewell, in Greenland." By the Rev. Samuel Haughton.

The observations discussed in this paper were made in 1863–4, by Missionary Asboe, at the station named above, and communicated to the author through the agency of Admiral Irminger, of the Danish Royal Navy.

1868. "On the Tides of Bombay and Karachi." By William Parkes, Esq.

The Bombay observations discussed in this paper were made by a self-acting tide gauge in the years 1846, 1847, and 1848, of which the records were kept at the Admiralty.

The Karachi observations (also automatic) were made during six months of the year 1865.

The following Papers worthy of notice are in the Reports of the Meetings of the British Association, the reference being the year of the meeting :—

1861. "Notice of Tidal Observations." By Rear-Admiral Fitzroy.

This is a very short abstract of what appears to be a very valuable paper, and which is probably now in the possession of the Association. It is stated that the "accompanying volume of tide tables shows to what extent our acquaintance with the facts of the subject goes at present."

Reference is made to the want of observations in the central parts of the Pacific ocean ; and at numerous isolated points seldom visited for expressly tidal objects ; and a hint is given that a vessel ought to be specially employed for the purpose.

1862. "Report of the Committee appointed in 1861 to report upon a Peculiarity of the Tide Observations at the Port of Hull."

The peculiarity observed was that "whenever the tide reaches the 16 ft. mark it is then three hours to high water, whether they be spring tides or neap tides."

The Committee succeeded in making observations which completely verified the peculiarity referred to, but were unable to throw much light on the cause of the phenomenon.

1864. "Report on Tidal Observations made in the Humber, and in the Rivers Trent and Ouse."

This report is accompanied by tables giving the details of the observations made at four stations: Hull, Gainsborough, Goole, and Naburn Lock. The peculiarity at the port of Hull, referred to above, was again verified.

1868. "Report of the Committee for the purpose of promoting the Extension, Improvement, and Harmonic Analysis of Tidal Observations, drawn up by Sir William Thomson."

To this most important report, which will probably produce a complete revolution in the mode of making and discussing tide observations, we shall again refer at the conclusion of this Appendix.

The publication of the British Admiralty is :—

1. "The Tide Tables for the English and Irish Ports; also the Times and Heights of High Water at Full and Change, for the Principal Places of the Globe." Published annually by J. D. Potter, London. Price 1s. 6d.

It only remains now to give a more detailed account of the Report of Sir William Thomson to the Meeting of the British Association in 1868, which has been before referred to, as it will probably lead to a complete revolution in the method of making and reducing tide observations. The principal object of the paper is to effect the discussion of a series of tide observations (considering the tidal wave as due to the action of the sun and moon) in a way more in accordance with the refined methods of modern mathematical treatment than has been done hitherto. The tide wave, considered with reference to the time when it reaches a given point of the earth's surface, and to its height at that point, is made up of the superposition of a series of waves of different amplitudes and periods arising from the different relative positions and varying distances from the earth of the disturbing bodies, the sun and moon, and of the variation of certain elements of their orbits. Of these waves, of which each has for its analytical expression a term of the form R $\cos\left(\frac{2\pi t}{T} - \epsilon\right)$, the author of the Report distinguishes twenty-three, particularised as follows :—

Two.—The lunar monthly and solar annual (elliptic).

Two.—The lunar fortnightly and solar semiannual (declinational).

Four.—The lunar and solar diurnal (declinational).

Two.—The lunar and solar semidiurnal.

Seven.—The lunar and solar elliptic diurnal.

Four.—The lunar and solar elliptic semidiurnal.

Two.—The lunar and solar declinational semidiurnal.

The arguments of these waves, or coefficients of t, in the general expression given above, are given in terms of the sun and moon's orbital velocity, of the velocity of the earth's rotation, and of the annual progression of the earth's perigee ; and their values are tabulated (as a specimen) for two days of the year 1864.

The amplitude and the epoch of each tidal constituent are to be determined by observation, but, in the course of one year, only twenty out of the three and twenty constituents enumerated are distinguishable, and the forty constants

(amplitude and epoch for each) specifying them, are probably determinable with considerable accuracy, from the data afforded in the course of a year by a good self-registering tide gauge, or from accurate personal observations taken at equal short intervals of time.

The Report mentions, as one of the most interesting of the questions which can be proposed in reference to the tides, the effect which they have upon the time of the earth's rotation on its axis; and it is thought that "accurate observations of amounts and times of the tide on the shores of continents and islands of all seas might, with the assistance of improved dynamical theory, be fully expected to supply the requisite data for at least a rough estimate."

"We know, however," the Report goes on to say, "but little at present regarding the actual time of the spring tides in different parts of the ocean. . . . There must be observations or records valuable for determining this very important element for ports on all seas where any approach to a knowledge of the laws of the tides prevail. To collect information on this point from all parts of the world will be one of the most interesting parts of the work of this Committee."

The Times and Heights of High water are calculated from the following Tables :—

TABLE I.

Showing the Semi-monthly inequality +, a constant ; or the Interval between the Moon's transit two days preceding a London tide and the Time of High water : the Moon's parallax being 57', declination 15° ; the Sun's parallax 8"·8, and declination 15°.

D's Transit B.		Brest.			Portsmouth.			Dover.			Sheerness.			Chatham.			London.			D's Transit B.	
h	m	d	h	m	d	h	m	d	h	m	d	h	m	d	h	m	d	h	m	h	m
0	0	I	4	24	I	12	21	I	11	54	2	1	56	2	2	2	2	3	14	0	0
0	30	I	4	16	I	12	15	I	11	49	2	1	47	2	1	53	2	3	6	0	30
1	0	I	4	8	I	12	8	I	11	43	2	1	39	2	1	44	2	2	58	1	0
1	30	I	4	0	I	12	1	I	11	38	2	1	30	2	1	36	2	2	51	1	30
2	0	I	3	52	I	11	53	I	11	32	2	1	22	2	1	29	2	2	43	2	0
2	30	I	3	45	I	11	46	I	11	26	2	1	15	2	1	22	2	2	36	2	30
3	0	I	3	39	I	11	40	I	11	21	2	1	9	2	1	15	2	2	29	3	0
3	30	I	3	34	I	11	35	I	11	17	2	1	5	2	1	9	2	2	25	3	30
4	0	I	3	33	I	11	32	I	11	13	2	1	3	2	1	6	2	2	23	4	0
4	30	I	3	32	I	11	30	I	11	11	2	1	4	2	1	7	2	2	24	4	30
5	0	I	3	35	I	11	32	I	11	12	2	1	10	2	1	13	2	2	28	5	0
5	30	I	3	42	I	11	37	I	11	14	2	1	21	2	1	25	2	2	36	5	30
6	0	I	3	56	I	11	49	I	11	22	2	1	37	2	1	41	2	2	51	6	0
6	30	I	4	15	I	12	4	I	11	33	2	1	56	2	2	0	2	3	10	6	30
7	0	I	4	33	I	12	21	I	11	47	2	2	12	2	2	18	2	3	27	7	0
7	30	I	4	48	I	12	36	I	12	2	2	2	25	2	2	33	2	3	39	7	30
8	0	I	4	56	I	12	47	I	12	12	2	2	32	2	2	45	2	3	47	8	0
8	30	I	5	1	I	12	53	I	12	16	2	2	35	2	2	46	2	3	53	8	30
9	0	I	5	0	I	12	54	I	12	17	2	2	33	2	2	40	2	3	53	9	0
9	30	I	4	57	I	12	52	I	12	16	2	2	29	2	2	35	2	3	49	9	30
10	0	I	4	51	I	12	47	I	12	13	2	2	24	2	2	30	2	3	44	10	0
10	30	I	4	45	I	12	41	I	12	9	2	2	18	2	2	24	2	3	38	10	30
11	0	I	4	38	I	12	34	I	12	4	2	2	11	2	2	18	2	3	30	11	0
11	30	I	+ 31		I	12	27	I	12	0	2	2	3	2	2	10	2	3	22	11	30

Continuation of Table I.

D's Transit B.		Harwich.			Hull.			Sunderland.			North Shields.			Leith.			Thurso.			D's Transit B.	
h	m	d	h	m	d	h	m	d	h	m	d	h	m	d	h	m	d	h	m	h	m
0	0	2	1	9	1	19	28	1	16	18	1	16	19	1	15	15	1	9	4	0	0
0	30	2	1	2	1	19	21	1	16	10	1	16	12	1	15	8	1	8	57	0	30
1	0	2	0	54	1	19	12	1	16	2	1	16	5	1	15	0	1	8	50	1	0
1	30	2	0	47	1	19	5	1	15	55	1	15	58	1	14	53	1	8	43	1	30
2	0	2	0	40	1	18	57	1	15	48	1	15	52	1	14	47	1	8	37	2	0
2	30	2	0	33	1	18	51	1	15	42	1	15	46	1	14	40	1	8	31	2	30
3	0	2	0	27	1	18	45	1	15	38	1	15	41	1	14	36	1	8	28	3	0
3	30	2	0	21	1	18	40	1	15	36	1	15	37	1	14	34	1	8	26	3	30
4	0	2	0	18	1	18	39	1	15	35	1	15	38	1	14	34	1	8	26	4	0
4	30	2	0	18	1	18	44	1	15	37	1	15	42	1	14	36	1	8	28	4	30
5	0	2	0	21	1	18	54	1	15	42	1	15	50	1	14	45	1	8	35	5	0
5	30	2	0	28	1	19	6	1	15	52	1	16	3	1	14	56	1	8	47	5	30
6	0	2	0	44	1	19	18	1	16	8	1	16	20	1	15	13	1	9	6	6	0
6	30	2	1	4	1	19	31	1	16	23	1	16	35	1	15	30	1	9	28	6	30
7	0	2	1	20	1	19	42	1	16	36	1	16	49	1	15	42	1	9	43	7	0
7	30	2	1	32	1	19	53	1	16	45	1	16	59	1	15	52	1	9	54	7	30
8	0	2	1	39	1	20	1	1	16	51	1	17	3	1	15	58	1	9	59	8	0
8	30	2	1	44	1	20	4	1	16	54	1	17	4	1	15	58	1	9	59	8	30
9	0	2	1	44	1	20	2	1	16	55	1	17	1	1	15	55	1	9	54	9	0
9	30	2	1	41	1	19	58	1	16	53	1	16	57	1	15	52	1	9	47	9	30
10	0	2	1	37	1	19	53	1	16	49	1	16	50	1	15	47	1	9	38	10	0
10	30	2	1	31	1	19	48	1	16	42	1	16	42	1	15	40	1	9	29	10	30
11	0	2	1	24	1	19	42	1	16	34	1	16	34	1	15	33	1	9	21	11	0
11	30	2	1	16	1	19	35	1	16	26	1	16	27	1	15	24	1	9	12	11	30

D's Transit B.		Greenock.			Liverpool.			Pembroke.			Portishead.			Holyhead.			Kingstown.			D's Transit B.	
h	m	d	h	m	d	h	m	d	h	m	d	h	m	d	h	m	d	h	m	h	m
0	0	1	12	48	1	12	0	1	6	51	1	7	50	1	10	47	1	11	47	0	0
0	30	1	12	42	1	11	52	1	6	43	1	7	43	1	10	38	1	11	41	0	30
1	0	1	12	34	1	11	45	1	6	35	1	7	34	1	10	30	1	11	34	1	0
1	30	1	12	26	1	11	37	1	6	27	1	7	26	1	10	24	1	11	27	1	30
2	0	1	12	18	1	11	29	1	6	20	1	7	17	1	10	18	1	11	21	2	0
2	30	1	12	11	1	11	21	1	6	13	1	7	8	1	10	14	1	11	15	2	30
3	0	1	12	4	1	11	15	1	6	7	1	6	59	1	10	10	1	11	10	3	0
3	30	1	11	58	1	11	9	1	6	0	1	6	52	1	10	7	1	11	7	3	30
4	0	1	11	55	1	11	6	1	5	55	1	6	46	1	10	7	1	11	6	4	0
4	30	1	11	54	1	11	5	1	5	51	1	6	42	1	10	9	1	11	7	4	30
5	0	1	11	56	1	11	10	1	5	50	1	6	39	1	10	16	1	11	15	5	0
5	30	1	12	2	1	11	20	1	5	50	1	6	42	1	10	28	1	11	26	5	30
6	0	1	12	15	1	11	37	1	5	58	1	6	55	1	10	46	1	11	38	6	0
6	30	1	12	30	1	11	59	1	6	11	1	7	12	1	11	3	1	11	51	6	30
7	0	1	12	46	1	12	16	1	6	32	1	7	32	1	11	16	1	12	3	7	0
7	30	1	13	0	1	12	28	1	6	51	1	7	50	1	11	26	1	12	13	7	30
8	0	1	13	9	1	12	35	1	7	3	1	8	7	1	11	31	1	12	21	8	0
8	30	1	13	14	1	12	37	1	7	10	1	8	15	1	11	33	1	12	26	8	30
9	0	1	13	15	1	12	35	1	7	14	1	8	18	1	11	31	1	12	28	9	0
9	30	1	13	13	1	12	31	1	7	15	1	8	18	1	11	26	1	12	26	9	30
10	0	1	13	10	1	12	25	1	7	14	1	8	16	1	11	20	1	12	19	10	0
10	30	1	13	6	1	12	20	1	7	11	1	8	11	1	11	13	1	12	11	10	30
11	0	1	13	1	1	12	13	1	7	5	1	8	5	1	11	6	1	12	3	11	0
11	30	1	12	55	1	12	6	1	6	57	1	7	58	1	10	57	1	11	55	11	30

Continuation of Table I.

☽'s Transit B.	Belfast.			Londonderry.			Sligo.			Galway.			Queenstown.			Waterford.			☽'s Transit B.
h m	d	h	m	d	h	m	d	h	m	d	h	m	d	h	m	d	h	m	h m
0 0	1	11	25	1	8	38	1	5	55	1	5	14	1	5	41	1	6	1	0 0
0 30	1	11	16	1	8	28	1	5	46	1	5	7	1	5	34	1	5	54	0 30
1 0	1	11	9	1	8	19	1	5	39	1	5	0	1	5	26	1	5	47	1 0
1 30	1	11	3	1	8	10	1	5	32	1	4	53	1	5	19	1	5	40	1 30
2 0	1	10	57	1	8	1	1	5	25	1	4	46	1	5	11	1	5	32	2 0
2 30	1	10	52	1	7	54	1	5	18	1	4	40	1	5	4	1	5	24	2 30
3 0	1	10	49	1	7	48	1	5	11	1	4	35	1	4	57	1	5	16	3 0
3 30	1	10	48	1	7	48	1	5	8	1	4	32	1	4	50	1	5	9	3 30
4 0	1	10	49	1	7	54	1	5	9	1	4	31	1	4	45	1	5	2	4 0
4 30	1	10	51	1	8	5	1	5	15	1	4	32	1	4	43	1	4	57	4 30
5 0	1	10	57	1	8	20	1	5	25	1	4	36	1	4	42	1	4	59	5 0
5 30	1	11	7	1	8	40	1	5	38	1	4	46	1	4	46	1	5	9	5 30
6 0	1	11	20	1	8	57	1	5	53	1	5	1	1	5	0	1	5	20	6 0
6 30	1	11	33	1	9	10	1	6	7	1	5	19	1	5	16	1	5	32	6 30
7 0	1	11	48	1	9	19	1	6	21	1	5	33	1	5	32	1	5	44	7 0
7 30	1	12	0	1	9	22	1	6	32	1	5	44	1	5	47	1	5	56	7 30
8 0	1	12	6	1	9	21	1	6	38	1	5	49	1	5	59	1	6	8	8 0
8 30	1	12	7	1	9	18	1	6	38	1	5	50	1	6	6	1	6	18	8 30
9 0	1	12	5	1	9	15	1	6	34	1	5	50	1	6	8	1	6	23	9 0
9 30	1	12	1	1	9	12	1	6	28	1	5	48	1	6	7	1	6	25	9 30
10 0	1	11	56	1	9	8	1	6	22	1	5	42	1	6	4	1	6	24	10 0
10 30	1	11	49	1	9	3	1	6	16	1	5	36	1	5	59	1	6	22	10 30
11 0	1	11	42	1	8	56	1	6	10	1	5	29	1	5	53	1	6	16	11 0
11 30	1	11	34	1	8	47	1	6	3	1	5	21	1	5	47	1	6	8	11 30

TABLE II.

Showing the correction for the Moon's parallax.

☽'s Transit B.	H. P. 54'	H. P. 55'	H. P. 56'	H. P. 57'	H. P. 58'	H. P. 59'	H. P. 60'	H. P. 61'	☽'s Transit B.
h	m	m	m	m	m	m	m	m	h
0	+ 1	+ 1	+ 1	0	0	− 1	− 1	− 1	0
1	− 1	− 1	− 1	0	0	+ 1	+ 1	+ 1	1
2	− 3	− 2	− 1	0	+ 1	+ 2	+ 3	+ 4	2
3	− 5	− 3	− 1	0	+ 1	+ 3	+ 5	+ 7	3
4	− 7	− 5	− . 2	0	+ 2	+ 4	+ 6	+ 8	4
5	− 9	− 6	− 3	0	+ 2	+ 5	+ 7	+ 9	5
6	− 4	− 2	− 1	0	+ 1	+ 2	+ 3	+ 4	6
7	+ 4	+ 2	+ 1	0	− 1	− 2	− 3	− 4	7
8	+ 9	+ 6	+ 3	0	− 2	− 5	− 7	− 9	8
9	+ 7	+ 5	+ 2	0	− 2	− 4	− 6	− 8	9
10	+ 5	+ 3	+ 1	0	− 1	− 3	− 5	− 7	10
11	+ 3	+ 2	+ 1	0	− 1	− 2	− 3	− 4	11

TABLE III.

Showing the correction for the Moon's declination.

D's Transit B.	0°	3°	6°	9°	12°	15°	18°	21°	24°	27°	30°	D's Transit B.
	Dec.	Dec.	Dec.	Dec.	Dec.	Dec.	Dec.	Dec.	Dec.	Dec.	Dec.	
h	m	m	m	m	m	m	m	m	m	m	m	h
0	−1	−1	0	0	0	0	+1	+1	+1	+1	+2	0
1	+1	+1	0	0	0	0	−1	−1	−1	−1	−2	1
2	+2	+2	+1	+1	+1	0	−1	−1	−2	−3	−4	2
3	+3	+3	+3	+2	+1	0	−1	−2	−3	−5	−7	3
4	+3	+3	+3	+2	+1	0	−1	−3	−5	−7	−10	4
5	+3	+3	+3	+2	+1	0	−2	−4	−6	−9	−12	5
6	+2	+2	+2	+1	+1	0	−1	−2	−4	−4	− 5	6
7	−2	−2	−2	−1	−1	0	+1	+2	+4	+4	+ 5	7
8	−3	−3	−3	−2	−1	0	+2	+4	+6	+9	+12	8
9	−3	−3	−3	−2	−1	0	+1	+3	+5	+7	+10	9
10	−3	−3	−3	−2	−1	0	+1	+2	+3	+5	+ 7	10
11	−2	−2	−1	−1	−1	0	+1	+1	+2	+3	+ 4	11

TABLE IV.

Showing the correction for the Sun's declination.

D's Transit B.	0°	3°	6°	9°	12°	15°	18°	21°	24°	D's Transit B.
	Dec.	Dec.	Dec.	Dec.	Dec.	Dec.	Dec.	Dec.	Dec.	
h	m	m	m	m	m	m	m	m	m	h
0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	+1	1
2	−1	−1	−1	−1	0	0	0	+1	+2	2
3	−2	−1	−1	−1	0	0	+1	+2	+4	3
4	−3	−2	−1	−2	0	0	+2	+3	+5	4
5	−3	−2	−2	−1	−1	0	+1	+3	+5	5
6	−1	−1	−1	−1	0	0	+1	+1	+2	6
7	+1	+1	+1	+1	0	0	−1	−2	−2	7
8	+3	+2	+2	+1	+1	0	−2	−3	−5	8
9	+3	+2	+1	+2	0	0	−2	−3	−5	9
10	+2	+1	+1	+1	0	0	−1	−2	−4	10
11	+1	+1	+1	+1	0	0	0	−1	−2	11

TABLE V.

Showing the correction for the Sun's parallax.

☽'s Transit B.	Jan. Dec. H. P. 9·00"	Feb. Nov. H. P. 8·96"	March Oct. H. P. 8·88"	April Sept. H. P. 8·80"	May August. H. P. 8·75"	June July H. P. 8·70"	☽'s Transit B.
h	m	m	m	m	m	m	h
0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	1
2	− 1	− 1	0	0	0	0	2
3	− 1	− 1	0	0	+ 1	+ 1	3
4	− 2	− 2	0	0	+ 2	+ 2	4
5	− 3	− 2	− 1	+ 1	+ 3	+ 3	5
6	− 2	− 1	− 1	+ 1	+ 2	+ 2	6
7	+ 2	+ 1	+ 1	− 1	− 2	− 2	7
8	+ 3	+ 2	+ 1	− 1	− 3	− 3	8
9	+ 2	+ 2	0	0	− 2	− 2	9
10	+ 1	+ 1	0	0	− 1	− 1	10
11	+ 1	+ 1	0	0	0	0	11

TABLE VI.

Showing the Semi-monthly inequality +, a constant, in the height of High water, with reference to the apparent time of the Moon's transit B, the Moon's parallax being 57′, declination 15°; the Sun's parallax 8″·8, and declination 15°.

☽'s Transit B.		Brest.	Ports- mouth.	Dover.	Sheerness.	Chatham.	London.	☽'s Transit B.	
h	m	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	h	m
0	0	19·06	13·50	18·66	16·10	18·17	20·71	0	0
0	30	19·06	13·40	18·68	16·05	18·04	20·65	0	30
1	0	18·92	13·30	18·61	15·96	17·87	20·57	1	0
1	30	18·66	13·15	18·45	15·83	17·67	20·47	1	30
2	0	18·36	13·00	18·24	15·59	17·45	20·25	2	0
2	30	17·93	12·84	17·97	15·32	17·16	19·95	2	30
3	0	17·31	12·55	17·54	14·98	16·79	19·52	3	0
3	30	16·62	12·21	17·03	14·56	16·33	19·01	3	30
4	0	15·88	11·88	16·48	14·17	15·77	18·48	4	0
4	30	15·13	11·55	15·93	13·81	15·31	17·93	4	30
5	0	14·47	11·17	15·36	13·46	14·96	17·54	5	0
5	30	14·02	10·92	14·82	13·14	14·71	17·31	5	30
6	0	13·83	10·71	14·51	13·10	14·58	17·33	6	0
6	30	13·84	10·63	14·43	13·18	14·52	17·44	6	30
7	0	14·08	10·80	14·72	13·48	14·79	17·63	7	0
7	30	14·55	11·13	15·20	13·84	15·29	17·90	7	30
8	0	15·17	11·50	15·75	14·21	15·79	18·38	8	0
8	30	15·88	11·84	16·29	14·61	16·25	18·90	8	30
9	0	16·66	12·30	16·85	14·96	16·67	19·41	9	0
9	30	17·37	12·63	17·34	15·22	17·12	19·75	9	30
10	0	18·03	12·88	17·78	15·61	17·52	20·02	10	0
10	30	18·56	13·13	18·17	15·84	17·83	20·26	10	30
11	0	18·84	13·30	18·41	16·03	18·04	20·50	11	0
11	30	19·01	13·42	18·58	16·13	18·17	20·73	11	30

Continuation of Table VI.

D's Transit B.		Harwich.	Hull.	Sunderland.	North Shields.	Leith.	Thurso.	D's Transit B.	
h	m	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	h	m
0	0	11·56	20·87	14·43	14·58	16·29	13·25	0	0
0	30	11·48	20·84	14·41	14·46	16·18	13·17	0	30
1	0	11·38	20·75	14·26	14·28	16· 0	13· 0	1	0
1	30	11·25	20·54	14·02	14·08	15·78	12·77	1	30
2	0	11·10	20·17	13·71	13·86	15·54	12·46	2	0
2	30	10·92	19·70	13·38	13·62	15·25	12·09	2	30
3	0	10·72	19·18	13·01	13·28	14·88	11·67	3	0
3	30	10·50	18·62	12·64	12·92	14·42	11·23	3	30
4	0	10·28	18·05	12·22	12·47	13·92	10·76	4	0
4	30	10·07	17·49	11·82	11·97	13·46	10·35	4	30
5	0	9·88	16·96	11·46	11·58	13·05	9·98	5	0
5	30	·9·75	16·52	11·18	11·33	12·73	9·67	5	30
6	0	9·72	16·34	11·02	11·29	12·58	9·52	6	0
6	30	9·79	16·39	11·03	11·39	12·67	9·50	6	30
7	0	9·95	16·78	11·25	11·64	12·87	9·61	7	0
7	30	10·17	17·43	11·64	11·95	13·21	9·84	7	30
8	0	10·43	18·06	12·09	12·29	13·60	10·30	8	0
8	30	10·70	18·66	12·54	12·66	14·08	10·84	8	30
9	0	10·94	19·22	12·95	13·05	14·61	11·45	9	0
9	30	11·18	19·70	13·31	13·50	15·14	12· 0	9	30
10	0	11·38	20·09	13·64	13·86	15·59	12·52	10	0
10	30	11·51	20·39	13·91	14·16	15·92	12·93	10	30
11	0	11·57	20·63	14·14	14·39	16·18	13·18	11	0
11	30	11·59	20·80	14·33	14·52	16·30	13·25	11	30

D's Transit B.		Greenock.	Liverpool.*	Pembroke.	Portishead.	Holyhead.	Kingstown.	D's Transit B.	
h	m	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	h	m
0	0	9·72	26·21	22·50	42·08	16· 0	10·94	0	0
0	30	9·74	26·21	22·50	41·89	15·94	10·88	0	30
1	0	9·71	26· 0	22·32	41·58	15·83	10·80	1	0
1	30	9·68	25·55	22·08	41·18	15·66	10·68	1	30
2	0	9·61	25·05	21·74	40·72	15·41	10·49	2	0
2	30	9·48	24·46	21·31	40·02	15·09	10·28	2	30
3	0	9·33	23·80	20·75	39·08	14·68	10·05	3	0
3	30	9·17	23·13	20·10	38·04	14·26	9·84	3	30
4	0	9· 0	22·38	19·46	36·88	13·84	9·61	4	0
4	30	8·83	21·63	18·83	35·45	13·41	9·38	4	30
5	0	8·64	20·88	18·08	34·02	13·03	9·13	5	0
5	30	8·44	20·30	17·42	32·90	12·73	8·92	5	30
6	0	8·29	20· 0	17·13	32·10	12·63	8·83	6	0
6	30	8·19	20·21	17·06	32·12	12·73	8·91	6	30
7	0	8·29	20·63	17·27	32·63	12·97	9·10	7	0
7	30	8·46	21·21	17·80	33·72	13·27	9·32	7	30
8	0	8·67	22· 0	18·50	35·05	13·66	9·55	8	0
8	30	8·85	22·71	19·31	36·45	14·11	9·79	8	30
9	0	9·04	23·63	20·04	37·80	14·55	10·04	9	0
9	30	9·18	24·30	20·73	38·92	14·95	10·28	9	30
10	0	9·31	24·80	21·31	39·95	15·30	10·50	10	0
10	30	9·44	25·30	21·77	40·78	15·60	10·70	10	30
11	0	9·56	25·63	22·12	41·52	15·80	10·86	11	0
11	30	9·66	26· 0	22·39	41·96	15·93	10·96	11	30

* + a constant, see Table VIa., page xxxvii.

Continuation of Table VI.

☽'s Transit B.		Belfast.	London- derry.	Sligo.	Galway.	Queens- town.	Waterford.	☽'s Transit B.	
h	m	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	h	m
0	0	9·43	7·72	11·25	14·83	11·75	12·42	0	0
0	30	9·40	7·64	11·16	14·80	11·75	12·42	0	30
1	0	9·37	7·51	11·01	14·68	11·69	12·39	1	0
1	30	9·32	7·36	10·80	14·47	11·58	12·33	1	30
2	0	9·24	7·18	10·50	14·20	11·37	12·21	2	0
2	30	9·14	7·0	10·17	13·84	11·12	12·04	2	30
3	0	9·0	6·75	9·82	13·43	10·84	11·83	3	0
3	30	8·83	6·48	9·47	12·94	10·55	11·53	3	30
4	0	8·63	6·16	9·14	12·34	10·19	11·21	4	0
4	30	8·45	5·83	8·83	11·76	9·86	10·88	4	30
5	0	8·30	5·70	8·58	11·30	9·55	10·54	5	0
5	30	8·18	5·61	8·41	10·97	9·29	10·17	5	30
6	0	8·09	5·68	8·38	10·87	9·14	9·96	6	0
6	30	8·06	5·92	8·41	10·95	9·12	9·83	6	30
7	0	8·07	6·14	8·55	11·17	9·26	10·02	7	0
7	30	8·17	6·35	8·80	11·55	9·50	10·21	7	30
8	0	8·36	6·55	9·15	12·02	9·78	10·54	8	0
8	30	8·61	6·74	9·51	12·50	10·11	10·92	8	30
9	0	8·86	6·96	9·90	12·98	10·47	11·25	9	0
9	30	9·06	7·17	10·27	13·42	10·82	11·58	9	30
10	0	9·22	7·33	10·60	13·82	11·12	11·87	10	0
10	30	9·33	7·48	10·87	14·18	11·37	12·08	10	30
11	0	9·41	7·60	11·09	14·49	11·57	12·20	11	0
11	30	9·44	7·71	11·21	14·72	11·71	12·31	11	30

TABLE VII.

Showing the correction for the Moon's parallax.

☽'s Transit B.	H. P. 54′	H. P. 55′	H. P. 56′	H. P. 57′	H. P. 58′	H. P. 59′	H. P. 60′	H. P. 61′	☽'s Transit B.
h	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	h
0	− ·66	− ·45	− ·23	0	+ ·24	+ ·49	+ ·74	+ 1·00	0
1	− ·66	− ·45	− ·23	0	+ ·24	+ ·49	+ ·74	+ 1·00	1
2	− ·65	− ·44	− ·23	0	+ ·23	+ ·47	+ ·72	+ ·98	2
3	− ·63	− ·43	− ·22	0	+ ·22	+ ·46	+ ·71	+ ·96	3
4	− ·61	− ·42	− ·21	0	+ ·22	+ ·45	+ ·69	+ ·94	4
5	− ·63	− ·43	− ·22	0	+ ·23	+ ·46	+ ·70	+ ·96	5
6	− ·65	− ·45	− ·23	0	+ ·24	+ ·48	+ ·73	+ ·99	6
7	− ·65	− ·45	− ·23	0	+ ·24	+ ·48	+ ·73	+ ·99	7
8	− ·63	− ·43	− ·22	0	+ ·23	+ ·46	+ ·70	+ ·96	8
9	− ·61	− ·42	− ·21	0	+ ·22	+ ·45	+ ·69	+ ·94	9
10	− ·63	− ·43	− ·22	0	+ ·22	+ ·46	+ ·71	+ ·96	10
11	− ·65	− ·44	− ·23	0	+ ·23	+ ·47	+ ·72	+ ·98	11

TABLE VIII.

Showing the correction for the Moon's declination.

D's Transit B.	0° Dec.	3° Dec.	6° Dec.	9° Dec.	12° Dec.	15° Dec.	18° Dec.	21° Dec.	24° Dec.	27° Dec.	30° Dec.	D's Transit B.
h	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	h
o	+·32	+·31	+·27	+·21	+·12	0	−·13	−·29	−·47	−·66	−·87	o
1	+·32	+·31	+·27	+·21	+·12	0	−·13	−·29	−·47	−·66	−·87	1
2	+·31	+·30	+·26	+·20	+·11	0	−·13	−·28	−·46	−·65	−·86	2
3	+·30	+·30	+·26	+·20	+·10	0	−·13	−·28	−·45	−·63	−·83	3
4	+·30	+·29	+·25	+·19	+·11	0	−·13	−·27	−·44	−·61	−·80	4
5	+·30	+·29	+·25	+·19	+·11	0	−·13	−·27	−·44	−·61	−·79	5
6	+·31	+·30	+·26	+·20	+·12	0	−·13	−·28	−·46	−·63	−·83	6
7	+·31	+·30	+·26	+·20	+·12	0	−·13	−·28	−·46	−·63	−·83	7
8	+·30	+·29	+·25	+·19	+·11	0	−·13	−·27	−·44	−·61	−·79	8
9	+·30	+·29	+·25	+·19	+·11	0	−·13	−·27	−·44	−·61	−·80	9
10	+·30	+·30	+·26	+·20	+·10	0	−·13	−·28	−·45	−·63	−·83	10
11	+·31	+·30	+·26	+·20	+·11	0	−·13	−·28	−·46	−·65	−·86	11

TABLE IX.

Showing the correction for the Sun's declination.

D's Transit B.	0° Dec.	3° Dec.	6° Dec.	9° Dec.	12° Dec.	15° Dec.	18° Dec.	21° Dec.	24° Dec.	D's Transit B.
h	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	h
o	+·12	+·11	+·10	+·08	+·04	0	−·05	−·11	−·18	o
1	+·12	+·11	+·10	+·08	+·04	0	−·05	−·11	−·18	1
2	+·10	+·09	+·08	+·06	+·04	0	−·05	−·10	−·15	2
3	+·07	+·06	+·05	+·04	+·02	0	−·03	−·06	−·10	3
4	+·01	+·01	+·01	+·01	−·00	0	−·01	−·01	−·02	4
5	−·06	−·06	−·05	−·04	−·02	0	+·03	+·05	+·08	5
6	−·11	−·10	−·10	−·07	−·04	0	+·05	+·10	+·15	6
7	−·11	−·10	−·10	−·07	−·04	0	+·05	+·10	+·15	7
8	−·06	−·06	−·05	−·04	−·02	0	+·03	+·05	+·08	8
9	+·01	+·01	+·01	+·01	+·00	0	−·01	−·01	−·02	9
10	+·07	+·06	+·05	+·04	+·02	0	−·03	−·05	−·10	10
11	+·10	+·09	+·08	+·06	+·04	0	−·03	−·10	−·15	11

TABLE X.

Showing the correction for the Sun's parallax.

☽'s Transit B.	Jan. Dec.	Feb. Nov.	March Oct.	April Sept.	May August	June July	☽'s Transit B.
	H. P. 9·00″	H. P. 8·96″	H. P. 8·88″	H. P. 8·80″	H. P. 8·75	H. P. 8·70″	
h	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	h
0	+ ·09	+ ·06	+ ·03	− ·03	− ·05	− ·08	0
1	+ ·09	+ ·06	+ ·03	− ·03	− ·05	− ·08	1
2	+ ·07	+ ·04	+ ·02	− ·02	− ·04	− ·07	2
3	+ ·04	+ ·03	+ ·01	− ·01	− ·03	− ·04	3
4	+ ·01	+ ·01	+ ·01	− ·01	− ·01	− ·01	4
5	− ·04	− ·03	− ·01	+ ·01	+ ·02	+ ·03	5
6	− ·08	− ·05	− ·03	+ ·03	+ ·05	+ ·07	6
7	− ·08	− ·05	− ·03	+ ·03	+ ·05	+ ·07	7
8	− ·04	− ·03	− ·01	+ ·01	+ ·02	+ ·03	8
9	+ ·01	+ ·01	+ ·01	− ·01	− ·01	− ·01	9
10	+ ·04	+ ·03	+ ·01	− ·01	− ·03	− ·04	10
11	+ ·07	+ ·04	+ ·02	− ·02	− ·04	− ·07	11

The preceding Tables, with the exception of Tables I. and VI., by which the times and heights of High Water are calculated, are taken from an Elementary Treatise on the Tides, by Sir J. W. Lubbock, Bart., F.R.S.*

In that treatise successive transits of the moon are distinguished by the letters A, B, C, D, E, F. So that if

A denotes the time of the moon's transit on Monday morning,

B may denote the time of the moon's transit on Monday afternoon ;

C may denote the time of the moon's transit on Tuesday morning,

D may denote the time of the moon's transit on Tuesday afternoon ;

E may denote the time of the moon's transit on Wednesday morning,

F may denote the time of the moon's transit on Wednesday afternoon.

F is also supposed to denote the time of the transit of the moon *immediately preceding* the time of high water at the London docks.

L F + i' denote the time of high water, that is, let i' be the *interval* with reference to the transit F, or the time to be added to F, in order to obtain the time of high water at London on any given day. Let i be the interval (for the same tide) with reference to the transit B, so that

$$B + i = F + i'$$
$$B - F = i' - i$$

It is now evident that if the interval of time which intervenes between the transits B and F were always the same, that is, if B − F were constant, $i' - i$ would be constant also. Now, as B − F varies considerably, the tables which are here given, are intended to afford the quantity i, having reference to the transit B two days previous.

* In consequence of the sensible difference which exists between the semi-monthly inequality in the *height* furnished by Bernoulli's theory, from that furnished by observation, Tables I. and VI. have been deduced from actual observations. All the other corrections which have been employed in predicting the tides have been deduced from Bernoulli's theory without modification. See also " Philosophical Transactions, 1836," pp. 217–266.

Examples of the use of the Tables.

	d	h	m
The Nautical Almanac gives apparent time of the Moon's			
transit (B) January	1	20	15
Table I. gives	2	3	50

			m	
H. P. 54′ 30″ -	„ II. „		$+7$	
Moon's dec. 20½° S.	„ III. „		$+3$	$+0$ 0 13
Sun's dec. 23° S.	„ IV. „		-4	
	„ V. „		$+3$	
	Equation of time -		$+4$	

	4	0	18

Which gives o h. 18 m. for the mean Time of High water on the 4th January, P.M., at London bridge.

			Feet.
The same transit gives, by Table	VI.	-	18·64
„	„	VII.	$-·51$
„	„	VIII.	$-·24$	$-$ ·73
„	„	IX.	$+·05$
„	„	X.	$-·03$

17·91

17 feet 11 inches being the calculated height of High water at London on 4th January, P.M.

In employing Tables VII., VIII., IX., and X., for other places than London, the quantities given in these Tables must be multiplied by a certain constant proportionate to the differences between their respective semi-monthly in-equalities and that of London, which

For Belfast -	-	-	-	-	0·4	For North Shields	-	-	-	1·0
Greenock	-	-	-	-	0·5	Holyhead	-	-	-	1·0
Harwich	-	-	-	-	0·5	Thurso -	-	-	-	1·1
Kingstown	-	-	-	-	0·6	Leith -	-	-	-	1·1
Londonderry -	-	-	-	-	0·6	Galway -	-	-	-	1·2
Portsmouth -	-	-	-	-	0·8	Dover -	-	-	-	1·2
Sligo -	-	-	-	-	0·8	Hull -	-	-	-	1·3
Queenstown -	-	-	-	-	0·8	Brest -	-	-	-	1·5
Waterford	-	-	-	-	0·8	Pembroke	-	-	-	1·6
Sheerness	-	-	-	-	0·9	Portishead	-	-	-	2·8
Sunderland	-	-	-	-	1·0					

The Six following abridged Tables are by the Rev. Dr. Whewell, the times being deduced from three, and the heights from five years' observations, made at Devonport dockyard.

c

TABLE I.

Showing the Semi-monthly inequality, or the interval between the apparent time of the Moon's transit, one and a-half days preceding a Devonport tide, and the time of High water, also the Semi-monthly inequality in the height of High water, with reference to the same transit, the Moon's horizontal parallax being 57', and declination 16½°.

D's Transit.	Interval.			Height.	D's Transit.	Interval.			Height.	D's Transit.	Interval.			Height.
h m	d	h	m	Feet.	h m	d	h	m	Feet.	h m	d	h	m	Feet.
0 30	1	18	30	15·34	4 30	1	17	35	12·82	8 30	1	19	7	13·85
1 30	1	18	11	15·01	5 30	1	17	45	12·24	9 30	1	19	7	14·64
2 30	1	17	55	14·41	6 30	1	18	19	12·29	10 30	1	18	59	15·14
3 30	1	17	40	13·64	7 30	1	18	52	12·92	11 30	1	18	46	15·40

TABLE II.

Showing the correction for the Moon's horizontal parallax.

D's Transit.	H. P. 54'	H. P. 55'	H. P. 56'	H. P. 57'	H. P. 58'	H. P. 59'	H. P. 60'	H. P. 61'	D's Transit.
h m	m	m	m	m	m	m	m	m	h m
0 30	− 5	− 3	− 1	0	+ 1	+ 3	+ 5	+ 6	0 30
1 30	− 8	− 5	− 3	0	+ 3	+ 5	+ 8	+10	1 30
2 30	−10	− 7	− 3	0	+ 3	+ 7	+10	+14	2 30
3 30	−14	− 9	− 5	0	+ 5	+ 9	+14	+18	3 30
4 30	−16	−11	− 5	0	+ 5	+11	+16	+21	4 30
5 30	−15	−10	− 5	0	+ 5	+10	+15	+20	5 30
6 30	− 9	− 6	− 3	0	+ 3	+ 6	+ 9	+12	6 30
7 30	− 2	− 2	− 1	0	+ 1	+ 2	+ 2	+ 3	7 30
8 30	+ 1	0	0	0	0	0	− 1	− 1	8 30
9 30	+ 1	+ 1	0	0	0	− 1	− 1	− 2	9 30
10 30	0	0	0	0	0	0	0	0	10 30
11 30	− 3	− 2	− 1	0	+ 1	+ 2	+ 3	+ 4	11 30

TABLE III.

Showing the correction for the Moon's declination.

D's Transit.	0° Dec.	3° Dec.	6° Dec.	9° Dec.	12° Dec.	15° Dec.	16½° Dec.	18° Dec.	21° Dec.	24° Dec.	27° Dec.	D's Transit.
h m	m	m	m	m	m	m	m	m	m	m	m	h m
0 30	+ 3	+ 2	+ 2	+ 1	+ 1	+ 1	0	− 1	− 1	− 2	− 4	0 30
1 30	+ 3	+ 3	+ 3	+ 2	+ 2	+ 1	0	− 1	− 2	− 3	− 4	1 30
2 30	+ 6	+ 5	+ 5	+ 4	+ 2	+ 1	0	− 1	− 3	− 5	− 7	2 30
3 30	+ 3	+ 3	+ 3	+ 2	+ 1	+ 1	0	− 1	− 4	− 9	−14	3 30
4 30	+ 6	+ 5	+ 4	+ 3	+ 2	+ 1	0	− 1	− 7	−13	−19	4 30
5 30	+ 4	+ 4	+ 4	+ 3	+ 3	+ 1	0	− 2	− 7	−12	−17	5 30
6 30	+ 4	+ 4	+ 3	+ 3	+ 3	+ 1	0	− 2	− 5	− 8	−13	6 30
7 30	+ 2	+ 2	+ 2	+ 2	+ 1	+ 1	0	− 1	− 3	− 5	− 9	7 30
8 30	− 2	− 2	− 2	− 2	− 1	0	0	0	+ 1	+ 3	+ 6	8 30
9 30	0	0	0	0	0	0	0	0	+ 1	+ 2	+ 5	9 30
10 30	0	0	0	0	0	0	0	0	0	0	0	10 30
11 30	+ 1	+ 1	+ 1	0	0	0	0	0	− 1	− 1	− 1	11 30

TABLE IV.

Showing the correction for the Moon's horizontal parallax.

D's Transit.	H. P. 54'	H. P. 55'	H. P. 56'	H. P. 57'	H. P. 58'	H. P. 59'	H. P. 60'	H. P. 61'	D's Transit.
h m	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	h m
0 30	− ·67	− ·45	− ·23	0	+ ·21	+ ·45	+ ·69	+ ·91	0 30
1 30	− ·73	− ·47	− ·26	0	+ ·24	+ ·50	+ ·75	+ ·99	1 30
2 30	− ·82	− ·54	− ·29	0	+ ·27	+ ·57	+ ·82	+1·11	2 30
3 30	− ·86	− ·57	− ·29	0	+ ·29	+ ·58	+ ·87	...	3 30
4 30	− ·87	− ·58	− ·30	0	+ ·29	+ ·58	+ ·87	...	4 30
5 30	− ·85	− ·58	− ·30	0	+ ·28	+ ·57	+ ·87	...	5 30
6 30	− ·79	− ·52	− ·27	0	+ ·26	+ ·53	+ ·83	...	6 30
7 30	− ·69	− ·46	− ·23	0	+ ·24	+ ·49	+ ·77	...	7 30
8 30	− ·63	− ·43	− ·20	0	+ ·22	+ ·45	+ ·67	...	8 30
9 30	− ·63	− ·41	− ·21	0	+ ·20	+ ·42	+ ·62	+ ·86	9 30
10 30	− ·62	− ·40	− ·20	0	+ ·21	+ ·42	+ ·63	+ ·86	10 30
11 30	− ·64	− ·44	− ·22	0	+ ·20	+ ·42	+ ·64	+ ·87	11 30

TABLE V.

Showing the correction for the Moon's declination.

D's Transit.	0° Dec.	3° Dec.	6° Dec.	9° Dec.	12° Dec.	15° Dec.	16½° Dec.	18° Dec.	21° Dec.	24° Dec.	27° Dec.	D's Transit.
h m	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	h m
0 30	+ ·35	+ ·31	+ ·27	+ ·21	+ ·14	+ ·04	0	− ·05	− ·19	− ·35	− ·54	0 30
1 30	+ ·25	+ ·22	+ ·19	+ ·15	+ ·11	+ ·04	0	− ·05	− ·16	− ·32	− ·55	1 30
2 30	+ ·21	+ ·19	+ ·13	+ ·11	+ ·08	+ ·03	0	− ·04	− ·14	− ·24	− ·42	2 30
3 30	+ ·25	+ ·23	+ ·17	+ ·13	+ ·07	+ ·03	0	− ·04	− ·10	− ·16	− ·26	3 30
4 30	+ ·27	+ ·25	+ ·22	+ ·16	+ ·10	+ ·03	0	− ·04	− ·13	− ·22	− ·33	4 30
5 30	+ ·30	+ ·29	+ ·25	+ ·21	+ ·12	+ ·06	0	− ·06	− ·25	− ·38	− ·55	5 30
6 30	+ ·50	+ ·46	+ ·39	+ ·29	+ ·18	+ ·07	0	− ·07	− ·29	− ·47	− ·74	6 30
7 30	+ ·56	+ ·50	+ ·42	+ ·30	+ ·13	+ ·04	0	− ·04	− ·24	− ·45	− ·71	7 30
8 30	+ ·54	+ ·45	+ ·37	+ ·26	+ ·14	+ ·04	0	− ·04	− ·19	− ·36	− ·57	8 30
9 30	+ ·43	+ ·37	+ ·30	+ ·21	+ ·12	+ ·03	0	− ·04	− ·19	− ·33	− ·52	9 30
10 30	+ ·44	+ ·43	+ ·36	+ ·26	+ ·16	+ ·05	0	− ·06	− ·18	− ·34	− ·48	10 30
11 30	+ ·42	+ ·38	+ ·33	+ ·26	+ ·17	+ ·06	0	− ·06	− ·23	− ·38	− ·55	11 30

TABLE VI.

Diurnal inequality of the height of High water at Devonport.

To be used with the Moon's declination three days anterior.

☽'s Declination.	0 to 4	5 to 9	10 to 14	15 to 18	19 to 21	22 to 24	25 to 26	27 to 28	29	30
Diurnal inequality	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
	0	1	2	3	4	5	6	7	8	9

For North declination add to the tide following the Moon's upper transit; subtract from the tide following the Moon's lower transit.

For South declination subtract from the tide following the Moon's upper transit; add to the tide following the Moon's lower transit.

Examples of the use of the foregoing Tables.

	d	h	m
The Nautical Almanac gives apparent time of the Moon's transit, January	1	20	15
Table I. gives	1	19	5

$$
\begin{array}{l}
\text{, II. ,,} \\
\text{, III. ,,} \\
\text{Equation of time}
\end{array}
\left.
\begin{array}{c}
\text{m} \\
0 \\
0 \\
+\ 4
\end{array}
\right\} +\quad 4
$$

$$3\ 15\ 24$$

Which gives 3 h. 24 m. for the mean time of High water on 4th of January, A.M., at Devonport.

	Feet.
The same transit gives, by Table I.	13·62

$$
\begin{array}{ll}
\text{Table IV.} & \\
\text{,, V.} & \quad -·54 \\
\text{,, VI. for diurnal inequality} & \quad -·17 \\
 & \quad +·09
\end{array}
\left.
\right\} -\quad ·62
$$

$$13·00$$

13 feet being the calculated height of High water on 4th of January, A.M.

The following abridged tables for computing the heights of High water at Liverpool, based on Sir J. W. Lubbock's calculations, are by the Rev. J. Pearson, M.A., F.R.A.S., from 10 years' observations.

TABLE VIa.

Showing the correction for Lunar or Anti-lunar tide.

D's Transit B.	January. Lunar.	January. Anti-lunar.	February. Lunar.	February. Anti-lunar.	March. Lunar.	March. Anti-lunar.	April. Lunar.	April. Anti-lunar.	May. Lunar.	May. Anti-lunar.	June. Lunar.	June. Anti-lunar.
h					Inches.							
0	+3	0	+5	+1	+6	+2	+6	+2	+4	+1	+3	0
3	+5	+1	+5	+2	+4	0	+5	+2	+4	+2	+5	+1
6	+7	+3	+5	0	+2	−3	+4	−1	+4	0	+6	+2
9	+5	+2	+5	+2	+5	0	+4	+1	+3	+1	+3	−1
12	+5	+2	+6	+2	+6	+3	+4	+1	+3	0	+2	−2
15	+6	+3	+6	+2	+5	+1	+3	0	+3	0	+3	−1
18	+5	+2	+4	0	+2	−4	+3	−2	+4	0	+5	+1
21	+4	0	+5	0	+4	0	+5	0	+5	+1	+4	+1

D's Transit B.	July. Lunar.	July. Anti-lunar.	August. Lunar.	August. Anti-lunar.	September. Lunar.	September. Anti-lunar.	October. Lunar.	October. Anti-lunar.	November. Lunar.	November. Anti-lunar.	December. Lunar.	December. Anti-lunar.
0	+3	0	+5	+1	+7	+3	+6	+2	+4	+2	+3	0
3	+5	+1	+4	+1	+4	+1	+5	+1	+4	0	+3	+1
6	+6	+1	+3	−1	+3	−2	+3	−1	+5	0	+5	+2
9	+3	−1	+3	−1	+4	0	+4	0	+5	+1	+6	+3
12	+3	−2	+4	0	+5	+1	+6	+2	+5	+1	+4	+1
15	+4	−1	+4	+1	+4	+2	+5	+2	+6	+2	+5	+2
18	+5	+1	+7	+3	+3	0	+4	0	+5	+1	+7	+3
21	+4	+1	+5	+2	+5	+2	+5	+1	+4	+1	+4	+1

TABLE VII.

Showing the correction for the Moon's parallax.

	Increasing.					Decreasing.				
	H. P. 53′	H. P. 55′	H. P. 57′	H. P. 59′	H. P. 61′	H. P. 59′	H. P. 57′	H. P. 55′	H. P. 53′	
					Inches.					
	−19	−6	+3	+13	+24	+15	+4	−5	−18	

TABLE VIII.

Showing the correction for Lunar or Anti-lunar declination.

Computed for the mean parallax of 57′, and for a mean inclination of orbit to the equator of 23°.*

North Declination (ascending).								
0	3°	6°	9°	12°	15°	18°	21°	24°
+13	+12	+11	+9	Inches. +5	+2	−2	−6	−10
North Declination (descending).								
24°	21°	18°	15°	12°	9°	6°	3°	0
−10	−9	−5	−4	−2	0	+1	+3	+4
South Declination (descending).								
0	3°	6°	9°	12°	15°	18°	21°	24°
+4	+2	+2	0	−1	−1	−3	−7	−5
South Declination (ascending).								
24°	21°	18°	15°	12°	9°	6°	3°	0
−5	−2	+2	+6	+8	+10	+12	+12	+13

* With the parallax ranging from 53′ to 57′, the increments must be decreased one inch; with the parallax ranging from 57′ to 61′, the increments must be increased one inch. Alterations due to change in the inclination of orbit require separate tables.

TABLE IX.*

Showing the correction for Solar or Anti-solar declination.

| Solar or Anti-solar declination, South. | | > < | | Solar or Anti-solar declination, North. | | > < | | Solar or Anti-solar declination, South. |

Dec.	☽'s Transit B. Hours.							
	0 12	3 15	6 18	9 21	12 0	15 3	18 6	21 9	24 12
					Inches.				
24°	+3	+4	+6	+2	0	+2	+5	+5	+3
21°	+4	+5	+5	+1	+1	+2	+5	+5	+4
18°	+4	+5	+5	+2	+2	+2	+4	+5	+4
15°	+5	+4	+4	+2	+3	+2	+3	+4	+5
12°	+5	+4	+3	+3	+4	+3	+2	+4	+5
9°	+6	+4	+2	+3	+4	+3	+1	+4	+6
6°	+5	+4	+1	+3	+4	+3	+1	+4	+6
3°	+6	+5	+1	+2	+5	+4	0	+4	+6
0°	+7	+5	−2	+4	+6	+4	−2	+5	+7

* Computed for the summer months; for the winter months, the corrections must be slightly increased.

The foregoing tables for Liverpool are deduced from the action of four separate tides, super-imposed in pairs, and which are :—

    1. A lunar tide caused by the direct action of the moon.

    2. An anti-lunar tide caused by the obverse action of the moon.

    3. A solar tide due to the direct action of the sun.

    4. An anti-solar tide due to the obverse action of the sun.

For transit B., *see* page xxxii.

Lower transits (B) are followed by lunar tides; upper transits (B) by anti-lunar tides.

All transits (B) occurring between 0 h. and 12 h. (apparent Greenwich time) give morning tides; those between 12 h. and 24 h., afternoon tides; those between 6 h. and 18 h. are connected with solar tides; and those between 18 h. and 6 h. with anti-solar tides.

For anti-lunar tides the declination must be reversed as regards north and south, ascending and descending, from that governing lunar tides; that is, from the declination given in the Nautical Almanac.

In like manner, for anti-solar tides, the declination as regards north and south must also be reversed.

Example of the use of the foregoing Tables.

Apparent time of the Moon's lower transit (B), January 1st.

							ft.	in.
(*Anti-lunar and solar*)	-	- 20 h. 15 m.						
	Table	VI., page xxix, gives		-		-	22	4
	,,	VI*a*.	-	,,	-	+ 1		
H. P. 54′ 30″ dec.	,,	VII.	-	,,	-	— 8		
Lunar dec. 20½° N., as.	,,	VIII.	-	,,	-	— 4	— 0	8
Solar dec. 23° S.	,,	IX.	-	,,	-	+ 3		
							21	8

21 feet 8 inches being the calculated height of High water at Liverpool on 3rd January P.M., above the Admiralty datum.

To find the time of High water *approximately*.

To the time of Moon's meridian passage (corrected for longitude), add the establishment of the port.

If the sum be less than 12 hours, it is the time of High water P.M.; if it exceed 12 hours, it is the time of High water next morning; and to obtain the time for P.M. the previous day, subtract 12 h. 24 m.

If the sum exceed 24 hours, it is the time of High water P.M. the next day; for the time P.M. on the proposed day, subtract 24 h. 48 m.

TIDE TABLES

BRITISH AND IRISH PORTS

FOR THE YEAR

1899.

A

JANUARY, 1899.

Week Day	Month Day	Moon's Transit (H.M.)	Brest HW Morn. Time (H.M.)	Brest HW Morn. Height (F.I.)	Brest HW Aft. Time (H.M.)	Brest HW Aft. Height (F.I.)	Devonport HW Morn. Time	Devonport HW Morn. Height	Devonport HW Aft. Time	Devonport HW Aft. Height	Devonport LW Morn. Time	Devonport LW Morn. Height	Devonport LW Aft. Time	Devonport LW Aft. Height
S.	1	3m 3	6 7	17 2	6 24	17 0	7 34	14 5	8 10	13 5	1 54	2 0	2 9	1 4
M.	2	3 44	6 41	16 9	6 59	16 5	8 26	14 0	8 42	13 1	2 24	2 6	2 39	2 0
Tu.	3	4 25	7 18	16 1	7 38	15 8	8 58	13 6	9 15	12 9	2 54	3 1	3 10	2 9
W.	4	5 8	7 58	15 3	8 19	14 10	9 35	13 1	9 56	12 6	3 26	3 7	3 44	3 4
Th.	5	5 52	8 43	14 5	9 10	14 2	10 19	12 8	10 45	12 4	4 5	4 0	4 29	4 0
F.	6	6 40	9 41	14 0	10 18	14 0	11 14	12 3	11 46	12 3	4 58	4 5	5 30	4 4
S.	7	7 32	10 57	14 1	11 37	14 3	—	—	0 23	12	6 4	4 7	6 40	4 4
S.	8	8 29	—	—	0 17	14 8	1 2	12 6	1 42	12 8	7 17	4 2	7 56	3 10
M.	9	9 31	0 55	15 3	1 29	16 0	2 21	13 2	2 59	13 4	8 37	3 2	9 17	2 11
Tu.	10	10 35	1 59	16 10	2 27	17 8	3 36	14 2	4 *10	14 3	9 53	2 0	10 26	1 10
W.	11	11 40	2 53	18 6	3 19	19 2	4 40	15 2	5 8	14 11	10 54	0 8	11 22	0 9
Th.	12	0a 41	3 45	19 8	4 10	20 1	5 36	16 0	6 3	15 6	11 50	*0 4	—	—
F.	13	1 39	4 34	20 2	4 57	20 4	6 29	16 6	6 53	15 9	0 18	0 0	0 44	*1 2
S.	14	2 33	5 19	20 4	5 41	20 3	7 16	16 9	7 39	15 9	1 8	*0 3	1 32	*1 2
S.	15	3 24	6 3	19 11	6 25	19 7	8 2	16 6	8 24	15 5	1 55	*0 1	2 18	*0 9
M.	16	4 13	6 47	19 0	7 9	18 4	8 44	16 0	9 3	14 11	2 40	0 5	3 0	0 2
Tu.	17	5 1	7 31	17 6	7 53	16 9	9 22	15 1	9 40	14 2	3 18	1 2	3 35	1 2
W.	18	5 49	8 15	15 11	8 38	15 2	10 0	14 0	10 20	13 3	3 52	2 2	4 10	2 6
Th.	19	6 38	9 4	14 6	9 34	13 10	10 42	12 11	11 9	12 6	4 30	3 3	4 54	3 8
F.	20	7 28	10 10	13 5	10 51	13 2	11 38	12 2	—	—	5 23	4 2	5 54	4 7
S.	21	8 18	11 33	13 1	—	—	0 11	12 0	0 48	11 8	6 27	4 10	7 3	5 0
S.	22	9 9	0 15	13 3	0 53	13 6	1 27	12 0	2 6	11 10	7 41	4 6	8 21	4 6
M.	23	9 59	1 27	13 11	1 56	14 5	2 44	12 6	3 19	12 4	9 0	3 10	9 36	3 10
Tu.	24	10 47	2 20	15 1	2 42	15 8	3 52	13 3	4 21	12 10	10 9	2 10	10 37	3 1
W.	25	11 34	3 1	16 2	3 19	16 8	4 44	14 0	5 6	13 5	11 0	1 10	11 21	2 4
Th.	26	m.	3 37	17 2	3 54	17 6	5 26	14 6	5 45	13 10	11 41	1 2	mid.	1 9
F.	27	0 19	4 11	17 9	4 27	17 11	6 3	14 11	6 20	14 2	—	—	0 18	0 6
S.	28	1 2	4 42	18 1	4 57	18 3	6 37	15 2	6 53	14 5	0 35	1 3	0 51	0 3
S.	29	1 43	5 12	18 4	5 27	18 4	7 7	15 2	7 21	14 5	1 7	1 2	1 22	0 5
M.	30	2 25	5 42	18 3	5 57	18 2	7 35	15 0	7 51	14 4	1 37	1 2	1 52	0 8
Tu.	31	3 6	6 13	18 0	6 29	17 8	8 7	14 8	8 23	14 0	2 7	1 6	2 22	1 2

Half mean spring range.	9ft. 6in.	7ft. 9in.

Phases of the Moon.

	D.	H.	M.	
Last Quarter -	5	3	22	Morning.
New - - -	11	10	50	Afternoon.
First Quarter -	18	4	36	Afternoon.
Full - - -	26	7	34	Afternoon.
In Perigee - -	12	2		Morning.
In Apogee - -	25	6		Afternoon.

Moon's declination at noon.

M.D.	o	'	M.D.	o	'	M.D.	o	'	M.D.	o	'
1	7 N.42		9	24 S.43		17	9 N.50		25	20 N.39	
2	2	47	10	24	17	18	14	42	26	17	24
3	2 S.19		11	22	5	19	18	45	27	13	26
4	7	26	12	18	18	20	21	50	28	8	56
5	12	22	13	13	18	21	23	51	29	4	5
6	16	53	14	7	34	22	24	43	30	0 S.58	
7	20	41	15	1	34	23	24	26	31	6	3
8	23	23	16	4 N.20		24	24	23	3		

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for BREST add 18 m. DEVONPORT add 17 m.

* Below zero, or datum to which soundings on charts are reduced.

JANUARY, 1899.

WEEK DAY	MONTH DAY	PORTSMOUTH (H.M. Dockyard) High Water — APPROXIMATE {RISE 7 20 / FALL 5 10}				Low Water				DOVER (North pier) APPROXIMATE {RISE 5 0 / FALL 7 30}				☾'s AGE AT NOON
		MORNING		AFTERNOON		MORNING		AFTERNOON		MORNING		AFTERNOON		
		Time H.M.	Height F.I.	Time H.M.	Height F.I.	Time H.M.	Height F.I.	Time H.M.	Height F.I.	Time H.M.	Height F.I.	Time H.M.	Height F.I.	D.
S.	1	1 5	12 5	2 8	12 5	6 49	1 2	7 5	1 4	1 30	17 5	1 47	17 4	19·0
M.	2	2 25	12 4	2 42	12 3	7 21	1 6	7 37	1 9	2 5	17 3	2 23	17 1	20·0
Tu.	3	3 0	12 11	3 18	11 11	7 55	2 0	8 14	2 3	2 41	16 10	2 59	16 7	21·0
W.	4	3 37	11 9	3 56	11 7	8 35	2 6	8 58	2 9	3 18	16 4	3 37	16 0	22·0
Th.	5	4 17	11 5	4 40	11 2	9 25	3 1	9 55	3 4	3 57	15 8	4 19	15 4	☾
F.	6	5 6	11 0	5 36	10 10	10 26	3 6	11 1	3 7	4 43	15 0	5 10	14 9	24·0
S.	7	6 10	10 9	6 46	10 9	11 40	3 7	—	—	5 4	14 7	6 15	14 7	25·0
S.	8	7 25	10 11	8 5	11 2	0 21	3 6	1 0	3 2	6 52	14 10	7 31	15 4	26·0
M.	9	8 44	11 6	9 20	11 11	1 34	2 9	2 6	2 3	8 9	15 10	8 44	16 5	27·0
Tu.	10	9 53	12 4	10 22	12 10	2 35	1 9	3 3	1 2	9 16	17 0	9 46	17 7	28·0
W.	11	10 49	13 2	11 15	13 6	3 29	0 8	3 54	0 4	10 14	18 2	10 42	18 8	●
Th.	12	11 41	13 9	—	—	4 19	0 0	4 44	*0 0	11 10	19 1	11 38	19 4	0·6
F.	13	0 6	14 0	0 31	14 1	5 9	*0 6	5 33	*0 7	—	—	0 5	19 6	1·6
S.	14	0 55	14 1	1 19	14 1	5 55	*0 7	6 17	*0 7	0 30	19 8	0 55	19 9	2·6
S.	15	1 42	14 0	2 4	13 10	6 39	*0 6	7 1	*0 3	1 19	19 8	1 43	19 6	3·6
M.	16	2 26	13 8	2 48	13 5	7 23	0 1	7 45	0 6	2 6	19 3	2 29	18 10	4·6
Tu.	17	3 10	13 1	3 31	12 9	8 6	0 11	8 28	1 2	2 51	18 4	3 12	17 9	5·6
W.	18	3 52	12 5	4 13	12 0	8 51	1 11	9 17	2 6	3 33	17 2	3 54	16 6	☽
Th.	19	4 35	11 7	5 0	11 2	9 46	3 0	10 17	3 4	4 16	15 11	4 39	15 3	7·6
F.	20	5 29	10 10	6 3	10 6	10 52	3 8	11 31	3 10	5 5	14 8	5 36	14 2	8·6
S.	21	6 40	10 4	7 21	10 3	—	—	0 14	3 11	6 10	13 11	6 48	13 11	9·6
S.	22	8 3	10 5	8 43	10 7	0 56	3 10	1 34	3 7	7 29	14 1	8 9	14 5	10·6
M.	23	9 18	10 10	9 48	11 1	2 7	3 3	2 36	2 11	8 46	14 9	9 11	15 2	11·6
Tu.	24	10 14	11 5	10 37	11 9	3 1	2 6	3 23	2 1	9 36	15 7	9 59	16 0	12·6
W.	25	10 57	12 0	11 15	12 2	3 44	1 9	4 3	1 6	10 21	16 4	10 42	16 8	13·6
Th.	26	11 33	12 5	11 50	12 7	4 21	1 3	4 39	1 1	11 1	17 0	11 20	17 4	○
F.	27	—	—	0 7	12 9	4 56	0 11	5 12	0 9	11 39	17 6	11 56	17 9	15·6
S.	28	0 24	12 11	0 40	13 0	5 27	0 7	5 42	0 6	—	—	0 13	17 11	16·6
S.	29	0 56	13 0	1 12	13 0	5 56	0 6	6 10	0 6	0 30	18 0	0 47	18 1	17·6
M.	30	1 27	13 0	1 42	12 11	6 25	0 6	6 40	0 6	1 3	18 2	1 19	18 2	18·6
Tu.	31	1 58	12 11	2 14	12 10	6 55	0 8	7 10	0 11	1 36	18 1	1 53	17 11	19·6

Half mean spring range. 6ft. 9in. 9ft. 4in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	3 47	Sub.	9	7 21	Sub.	17	10 20	Sub.	25	12 34	Sub.
2	4 15		10	7 46		18	10 40		26	12 47	
3	4 43		11	8 10		19	10 58		27	12 59	
4	5 11		12	8 33		20	11 16		28	13 11	
5	5 38		13	8 56		21	11 33		29	13 21	
6	6 4		14	9 18		22	11 50		30	13 31	
7	6 30		15	9 40		23	12 5		31	13 40	
8	6 56		16	10 0		24	12 20				

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for PORTSMOUTH add 4 m. | DOVER subtract 4 m.
* Below zero, or datum to which soundings on charts are reduced.

JANUARY, 1899.

Week Day	Month Day	Moon's Transit H. M.	SHEERNESS (H.M. Dockyard) High Water — Morning Time H. M.	Height F. I.	Afternoon Time H. M.	Height F. I.	CHATHAM (H.M. Dockyard) High Water — Morning Time H. M.	Height F. I.	Afternoon Time H. M.	Height F. I.	Low Water — Morning Time H. M.	Height F. I.	Afternoon Time H. M.	Height F. I.
S.	1	3m 3	3 4	15 1	3 20	15 0	3 10	16 9	3 27	16 8	9 27	1 7	9 41	i 8
M.	2	3 44	3 37	14 11	3 54	14 9	3 44	16 7	4 1	16 6	9 55	1 9	10 9	1 9
Tu.	3	4 25	4 11	14 7	4 29	14 5	4 18	16 4	4 35	16 2	10 24	1 10	10 39	1 11
W.	4	5 8	4 48	14 3	5 8	14 1	4 52	15 11	5 11	15 7	10 55	2 1	11 13	2 4
Th.	5	5 52	5 29	13 10	5 52	13 8	5 32	15 4	5 55	15 2	11 32	2 8	11 54	3 0
F.	6	6 40	6 19	13 5	6 49	13 3	6 22	15 0	6 52	14 10	—	—	0 22	3 3
S.	7	7 32	7 23	13 2	8 0	13 3	7 26	14 9	8 3	14 8	0 55	3 3	1 32	3 1
S.	8	8 29	8 38	13 4	9 16	13 7	8 42	14 8	9 22	14 11	2 13	2 10	2 56	2 7
M.	9	9 31	9 54	13 11	10 30	14 3	10 2	15 5	10 39	15 11	3 37	2 3	4 16	1 11
Tu.	10	10 35	11 3	14 8	11 32	15 1	11 12	16 5	11 41	16 10	4 52	1 7	5 25	1 3
W.	11	11 40	11 59	15 6	—	—	—	—	0 7	17 4	5 56	0 11	6 25	0 7
Th.	12	oa41	0 25	15 11	0 51	16 3	0 33	17 10	0 58	18 4	6 52	0 4	7 18	0 0
F.	13	1 39	1 17	16 6	1 42	16 9	1 23	18 8	1 48	18 10	7 44	*0 2	8 10	*0 5
S.	14	2 33	2 6	16 10	2 28	16 10	2 12	19 0	2 34	18 11	8 34	*0 6	8 56	*0 7
S.	15	3 24	2 49	16 10	3 11	16 9	2 56	18 10	3 18	18 9	9 15	*0 7	9 34	*0 6
M.	16	4 13	3 33	16 7	3 55	16 4	3 40	18 7	4 2	18 4	9 53	*0 3	10 12	0 0
Tu.	17	5 1	4 17	16 0	4 39	15 7	4 23	18 0	4 44	17 6	10 31	0 3	10 49	0 0
W.	18	5 49	5 1	15 2	5 23	14 8	5 5	17 0	5 26	16 5	11 8	1 0	11 28	1 7
Th.	19	6 38	5 46	14 3	6 12	13 10	5 49	15 10	6 14	15 5	11 49	2 3	—	—
F.	20	7 28	6 41	13 5	7 14	13 1	6 43	15 0	7 17	14 7	0 14	2 10	0 45	3 1
S.	21	8 18	7 51	12 10	8 32	12 9	7 55	14 3	8 35	14 0	1 22	3 3	2 5	3 3
S.	22	9 9	9 13	12 10	9 53	13 0	9 18	14 0	10 0	14 3	2 49	3 3	3 33	3 2
M.	23	9 59	10 30	13 3	11 3	13 6	10 38	14 7	11 11	14 11	4 15	3 0	4 52	2 10
Tu.	24	10 47	11 30	13 9	11 53	14 0	11 38	15 3	—	—	5 24	2 8	5 52	2 5
W.	25	11 34	—	—	0 14	14 3	0 1	15 7	0 21	15 11	6 18	2 2	6 41	2 1
Th.	26	m.	0 34	14 6	0 52	14 9	0 40	16 7	0 58	16 7	7 0	1 11	7 19	1 9
F.	27	0 19	1 10	15 0	1 27	15 3	1 16	16 10	1 34	17 1	7 38	1 7	7 56	1 5
S.	28	1 2	1 43	15 4	1 59	15 5	1 50	17 3	2 5	17 5	8 13	1 3	8 29	1 1
S.	29	1 43	2 14	15 6	2 28	15 6	2 20	17 6	2 34	17 6	8 44	1 0	8 58	0 11
M.	30	2 25	2 42	15 7	2 57	15 7	2 48	17 5	3 3	17 5	9 10	0 11	9 23	0 11
Tu.	31	3 6	3 12	15 7	3 27	15 6	3 18	17 4	3 34	17 3	9 36	1 0	9 49	1 1

Half mean spring range }   SHEERNESS 8ft. 0in.   CHATHAM 9ft. 1in.

Phases of the moon.

	D.	H.	M.	
Last Quarter -	5	3	22	Morning.
New - - -	11	10	50	Afternoon.
First Quarter -	18	4	36	Afternoon.
Full - - -	26	7	34	Afternoon.
In Perigee -	- 12	2		Morning.
In Apogee -	- 25	6		Afternoon.

Moon's declination at noon.

M.D.	o	'	M.D.	o	'	M.D.	o	'	M.D.	o	'
1	7 N.42		9	24 S.43		17	9 N.50		25	20 N.39	
2	2	47	10	24	17	18	14	42	26	17	24
3	2 S.19		11	22	5	19	18	45	27	13	26
4	7	26	12	18	18	20	21	50	28	8	56
5	12	22	13	13	18	21	23	51	29	4	5
6	16	53	14	7	34	22	24	43	30	0 S.58	
7	20	41	15	1	34	23	24	26	31	6	3
8	23	25	16	4 N.20		24	23	3			

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for SHEERNESS *subtract* 3 m   CHATHAM *subtract* 2 m.

* Below zero, or datum to which soundings on charts are reduced.

JANUARY, 1899.

WEEK DAY	MONTH DAY	LONDON (London bridge). APPROXIMATE {RISE 5 30, FALL 7 0} Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	HARWICH (Angel quay). APPROXIMATE {RISE 6 25, FALL 6 0} Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	HULL (Victoria dock). APPROXIMATE {RISE 5 40, FALL 6 30} Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	('S AGE AT NOON D.)
S.	1	4 24	19 8	4 41	19 6	2 21	10 10	2 38	10 9	8 56	19 3	9 13	19 1	19·0
M.	2	4 58	19 5	5 15	19 4	2 55	10 8	3 12	10 7	9 30	18 11	9 47	18 8	20·0
Tu.	3	5 32	19 2	5 50	18 11	3 29	10 6	3 46	10 5	10 5	18 5	10 24	18 2	21·0
W.	4	6 9	18 8	6 28	18 4	4 4	10 4	4 23	10 3	10 44	17 10	11 7	17 6	22·0
Th.	5	6 48	18 0	7 11	17 9	4 43	10 1	5 5	10 0	11 33	17 3	—	—	(
F.	6	7 37	17 7	8 5	17 5	5 30	9 11	5 57	9 10	0 3	16 11	0 34	16 8	24·0
S.	7	8 37	17 5	9 13	17 6	6 29	9 9	7 6	9 10	1 6	16 6	1 39	16 5	25·0
S.	8	9 52	17 7	10 31	17 9	7 45	9 11	8 24	10 0	2 13	16 7	2 48	16 11	26·0
M.	9	11 9	18 0	11 46	18 5	9 2	10 3	9 38	10 6	3 24	17 6	4 0	18 2	27·0
Tu.	10	—	—	0 20	18 11	10 12	10 9	10 43	11 0	4 33	18 9	5 2	19 5	28·0
W.	11	0 51	19 6	1 19	20 0	11 11	11 3	11 38	11 6	5 28	20 0	5 54	20 6	●
Th.	12	1 45	20 4	2 10	20 8	—	—	0 4	11 0	6 20	20 11	6 46	21 4	0·6
F.	13	2 34	21 0	2 58	21 4	0 29	11 10	0 54	11 11	7 12	21 8	7 37	21 10	1·6
S.	14	3 22	21 5	3 46	21 6	1 19	12 0	1 42	11 11	8 1	21 11	8 24	22 0	2·6
S.	15	4 9	21 6	4 32	21 6	2 5	11 10	2 28	11 9	8 46	21 11	9 8	21 7	3·6
M.	16	4 55	21 4	5 17	21 1	2 51	11 8	3 13	11 6	9 30	21 2	9 52	20 8	4·6
Tu.	17	5 38	20 8	5 59	20 2	3 35	11 4	3 56	11 1	10 14	20 1	10 36	19 5	5·6
W.	18	6 21	19 8	6 43	19 0	4 17	10 10	4 38	10 7	10 59	18 10	11 25	18 2	)
Th.	19	7 6	18 5	7 30	17 11	5 0	10 4	5 24	10 1	11 54	17 6	—	—	7·6
F.	20	7 57	17 6	8 28	17 3	5 50	9 11	6 21	9 9	0 25	16 11	0 58	16 5	8·6
S.	21	9 4	17 1	9 45	17 0	6 58	9 7	7 39	9 6	1 32	16 0	2 8	15 10	9·6
S.	22	10 27	16 11	11 8	17 0	8 21	9 7	9 1	9 8	2 45	15 11	3 23	16 2	10·6
M.	23	11 46	17 3	—	—	9 38	9 10	10 10	10 0	4 0	16 7	4 32	17 0	11·6
Tu.	24	0 19	17 7	0 48	17 11	10 39	10 3	11 4	10 5	4 59	17 5	5 22	17 10	12·6
W.	25	1 13	18 4	1 35	18 8	11 26	10 7	11 46	10 9	5 43	18 3	6 2	18 7	13·6
Th.	26	1 54	18 11	2 12	19 1	—	—	0 5	10 11	6 21	18 11	6 40	19 2	○
F.	27	2 30	19 4	2 47	19 7	0 23	11 0	0 40	11 1	6 58	19 5	7 15	19 8	15·6
S.	28	3 3	19 10	3 18	20 0	0 56	11 2	1 12	11 3	7 31	19 11	7 47	20 0	16·6
S.	29	3 33	20 1	3 48	20 2	1 28	11 3	1 43	11 3	8 2	20 1	8 16	20 2	17·6
M.	30	4 3	20 2	4 18	20 2	1 58	11 2	2 13	11 2	8 31	20 3	8 46	20 2	18·6
Tu.	31	4 33	20 3	4 49	20 2	2 29	11 1	2 45	11 1	9 2	20 0	9 19	19 9	19·6

Half mean spring range } LONDON 10ft. 4in.   HARWICH 5ft. 9in.   HULL 10ft. 5in.

Equation of time at noon.

M.D.	M. S.	Sub.	M.D.	M. S.	Sub.	M.D.	M. S.	Sub.	M.D.	M. S.	Sub.
1	3 47	Sub.	9	7 21	Sub.	17	10 20	Sub.	25	12 34	Sub.
2	4 15		10	7 46		18	10 40		26	12 47	
3	4 43		11	8 10		19	10 58		27	12 59	
4	5 11		12	8 33		20	11 16		28	13 11	
5	5 38		13	8 56		21	11 33		29	13 21	
6	6 4		14	9 18		22	11 50		30	13 31	
7	6 30		15	9 40		23	12 5		31	13 40	
8	6 56		16	10 0		24	12 20				

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for LONDON 0 m. | HARWICH *subtract* 5 m. | HULL *add* 1 m.

JANUARY, 1899.

WEEK DAY.	MONTH DAY.	MOON'S TRANSIT.	SUNDERLAND (North dock). APPROXIMATE - { RISE 6 5 / FALL 6 25				NORTH SHIELDS (Low lighthouse). APPROXIMATE - { RISE 5 40 / FALL 6 45				LEITH (East pier). APPROXIMATE - { RISE 6 0 / FALL 6 15			
			MORNING.		AFTERNOON.		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.	
		H. M.	Time. H. M.	Height. F. L.	Time. H. M.	Height. F. L.	Time. H. M.	Height. F. L.	Time. H. M.	Height. F. L.	Time. H. M.	Height. F. L.	Time. H. M.	Height. F. L.
S.	1	3m 3	5 46	13 1	6 3	12 11	5 50	13 2	6 7	13 1	4 44	14 9	5 1	14 8
M.	2	3 44	6 21	12 9	6 40	12 7	6 25	13 0	6 43	12 10	5 19	14 7	5 38	14 5
Tu.	3	4 25	6 59	12 5	7 19	12 3	7 2	12 9	7 22	12 7	5 58	14 3	6 18	14 0
W.	4	5 8	7 40	12 1	8 2	11 10	7 43	12 4	8 5	12 1	6 39	13 9	7 1	13 6
Th.	5	5 52	8 25	11 8	8 51	11 5	8 30	11 10	8 59	11 7	7 25	13 3	7 53	13 0
F.	6	6 40	9 20	11 3	9 52	11 2	9 30	11 5	10 5	11 4	8 24	12 10	8 58	12 9
S.	7	7 32	10 28	11 1	11 5	11 2	10 41	11 5	11 17	11 6	9 35	12 9	10 12	12 10
S.	8	8 29	11 41	11 4	—	—	11 54	11 9	—	—	10 48	13 0	11 23	13 4
M.	9	9 31	0 16	11 9	0 50	12 2	0 30	12 1	1 3	12 5	11 56	13 9	—	—
Tu.	10	10 35	1 22	12 8	1 53	13 1	1 33	12 9	2 1	13 3	0 27	14 2	0 55	14 9
W.	11	11 40	2 23	13 6	2 50	13 11	2 27	13 9	2 52	14 2	1 22	15 4	1 48	15 11
Th.	12	0a41	3 15	14 4	3 40	14 8	3 16	14 7	3 40	14 11	2 13	16 5	2 38	16 10
F.	13	1 39	4 5	15 0	4 29	15 2	4 4	15 2	4 28	15 4	3 2	17 0	3 25	17 1
S.	14	2 33	4 51	15 3	5 13	15 2	4 52	15 4	5 16	15 3	3 48	17 1	4 11	17 0
S.	15	3 24	5 36	15 1	5 59	14 10	5 40	15 1	6 3	14 11	4 34	16 11	4 57	16 8
M.	16	4 13	6 22	14 6	6 45	14 1	6 26	14 9	6 49	14 5	5 20	16 5	5 43	16 1
Tu.	17	5 1	7 8	13 8	7 31	13 3	7 11	14 0	7 34	13 7	6 6	15 8	6 30	15 1
W.	18	5 49	7 55	12 10	8 19	12 4	7 58	13 1	8 23	12 6	6 54	14 6	7 19	14 0
Th.	19	6 38	8 44	11 11	9 12	11 6	8 47	12 0	9 22	11 7	7 46	13 6	8 16	13 0
F.	20	7 28	9 45	11 1	10 22	10 9	9 57	11 3	10 34	11 0	8 49	12 7	9 26	12 4
S.	21	8 18	11 0	10 7	11 38	10 6	11 12	10 11	11 51	11 0	10 6	12 2	10 44	12 2
S.	22	9 9	—	—	0 15	10 9	—	—	0 29	11 1	11 21	12 3	11 56	12 6
M.	23	9 59	0 50	11 0	1 22	11 3	1 4	11 3	1 34	11 5	—	—	0 27	12 9
Tu.	24	10 47	1 50	11 7	2 15	11 11	1 59	11 8	2 21	12 0	0 53	13 0	1 15	13 5
W.	25	11 34	2 38	12 3	2 58	12 6	2 42	12 4	3 1	12 8	1 36	13 10	1 56	14 3
Th.	26	m.	3 17	12 9	3 34	13 0	3 18	13 0	3 35	13 3	2 15	14 7	2 33	14 11
F.	27	0 19	3 50	13 3	4 6	13 6	3 51	13 6	4 7	13 8	2 50	15 2	3 5	15 4
S.	28	1 2	4 22	13 8	4 37	13 10	4 23	13 10	4 38	13 11	3 20	15 6	3 35	15 6
S.	29	1 43	4 51	13 11	5 6	13 11	4 53	13 11	5 9	13 11	3 49	15 7	4 4	15 7
M.	30	2 25	5 21	13 10	5 37	13 9	5 25	13 10	5 41	13 10	4 19	15 6	4 35	15 6
Tu.	31	3 6	5 53	13 7	6 9	13 5	5 57	13 9	6 13	13 8	4 51	15 5	5 7	15 3

Half mean spring range	7ft. 2in.	7ft. 4in.	8ft. 2in.

Phases of the moon.				Moon's declination at noon.											
				M.D.	°	′	M.D.	°	′	M.D.	°	′	M.D.	°	′
	D.	H.	M.	1	7 N.42		9	24 S.43		17	9 N.50		25	20 N.39	
Last Quarter -	5	3	22 Morning.	2	2	47	10	24	17	18	14	42	26	17	24
New - - -	11	10	50 Afternoon.	3	2 S.19		11	22	5	19	18	45	27	13	26
First Quarter -	18	4	36 Afternoon.	4	7	26	12	18	18	20	21	50	28	8	56
Full - - -	26	7	34 Afternoon.	5	12	22	13	13	18	21	23	51	29	4	5
				6	16	53	14	7	34	22	24	43	30	0 S.58	
In Perigee - -	12	2	Morning.	7	20	41	15	1	34	23	24	26	31	6	3
In Apogee - -	25	6	Afternoon.	8	23	25	16	4 N.20		24	23	3			

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for
SUNDERLAND *add* 5 m. | NORTH SHIELDS *add* 6 m. | LEITH *add* 13 m.

JANUARY, 1899.

Week Day	Month Day	THURSO (near Scrabster pier). Approximate - { Rise 6 30 / Fall 6 0				GREENOCK (East dock). Approximate - { Rise 6 30 / Fall 6 0				LIVERPOOL (George pier). Approximate - { Rise 5 35 / Fall 6 50				☾'s Age at Noon
		Morning.		Afternoon.		Morning.		Afternoon.		Morning.		Afternoon.		
		Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	D.
S.	1	10 53	11 7	11 11	11 5	2 17	9 4	2 33	9 3	1 27	24 3	1 43	24 11	19·0
M.	2	11 30	11 3	11 49	11 1	2 49	9 2	3 6	9 2	2 0	23 9	2 17	24 5	20·0
Tu.	3	—	—	0 9	10 10	3 23	9 1	3 41	9 0	2 34	23 3	2 52	23 10	21·0
W.	4	0 30	10 7	0 52	10 4	4 0	8 11	4 20	8 10	3 11	22 9	3 31	23 2	22·0
Th.	5	1 16	10 2	1 44	10 0	4 41	8 9	5 5	8 8	3 54	22 1	4 19	22 1	☾
F.	6	2 15	9 10	2 50	9 8	5 31	8 6	6 1	8 5	4 48	21 1	5 22	21 4	24·0
S.	7	3 30	9 7	4 10	9 8	6 36	8 4	7 13	8 3	6 0	21 3	6 40	21 3	25·0
S.	8	4 48	9 9	5 24	10 0	7 51	8 4	8 29	8 6	7 20	22 0	7 58	22 1	26·0
M.	9	5 58	10 5	6 28	10 11	9 7	8 8	9 42	8 11	8 34	23 3	9 6	23 4	27·0
Tu.	10	6 54	11 7	7 18	12 3	10 14	9 2	10 44	9 4	9 35	25 0	10 2	24 11	28·0
W.	11	7 41	12 10	8 4	13 5	11 12	9 6	11 39	9 8	10 28	26 11	10 54	26 2	●
Th.	12	8 27	13 9	8 50	13 11	—		0 6	9 10	11 20	28 2	11 45	27 5	0·6
F.	13	9 13	14 1	9 36	14 1	0 32	10 0	0 58	10 1	—		0 10	29 1	1·6
S.	14	10 0	14	10 24	13 11	1 23	10 2	1 46	10 3	0 33	28 1	0 56	29 4	2·6
S.	15	10 48	13 8	11 12	13 4	2 8	10 3	2 30	10 2	1 19	27 6	1 41	28 9	3·6
M.	16	11 36	12 11	mid.	12	2 52	10 0	3 13	9 10	2 3	26 8	2 24	27 8	4·6
Tu.	17	—	—	0 24	11 11	3 33	9 8	3 54	9 6	2 44	25 7	3 5	26 0	5·6
W.	18	0 48	11 5	1 12	10 11	4 15	9 4	4 36	9 1	3 26	24 0	3 48	24 3	☽
Th.	19	1 38	10 5	2 7	10 0	4 59	8 10	5 25	8 7	4 12	22 3	4 40	22 2	7·6
F.	20	2 41	9 7	3 21	9 3	5 55	8 4	6 29	8 2	5 13	20 9	5 51	20 9	8·6
S.	21	4 3	9 0	4 44	8 11	7 6	8 0	7 46	7 11	6 34	20 5	7 17	20 5	9·6
S.	22	5 23	8 11	5 59	9 1	8 27	8 0	9 5	8 1	7 57	20 8	8 34	20 10	10·6
M.	23	6 29	9 5	6 54	9 9	9 40	8 3	10 9	8 5	9 5	21 8	9 32	21 6	11·6
Tu.	24	7 15	10 3	7 33	10 9	10 34	8 7	10 57	8 8	9 55	22 10	10 16	22 7	12·6
W.	25	7 49	11 2	8 5	11 7	11 11	8 9	11 38	8 10	10 35	23 11	10 54	23 7	13·6
Th.	26	8 21	11 11	8 37	12 2	11 58	9 0	—		11 12	24 11	11 29	24 6	○
F.	27	8 53	12 4	9 8	12 5	0 17	9 2	0 35	9 3	11 46	25 7	—		15·6
S.	28	9 23	12 6	9 38	12 7	0 51	9 4	1 7	9 5	0 2	25 1	0 18	26 2	16·6
S.	29	9 53	12 7	10 8	12 6	1 23	9 6	1 39	9 6	0 34	25 6	0 49	26 7	17·6
M.	30	10 24	12 6	10 40	12 4	1 54	9 6	2 9	9 7	1 4	25 6	1 19	26 5	18·6
Tu.	31	10 57	12 2	11 15	11 11	2 24	9 7	2 40	9 6	1 34	25 2	1 50	26 1	19·6

Half mean spring range }	6ft. 7in.	4ft. 10in.	13ft. 9in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	3 47	Sub.	9	7 21	Sub.	17	10 20	Sub.	25	12 34	Sub.
2	4 15		10	7 46		18	10 40		26	12 47	
3	4 43		11	8 10		19	10 58		27	12 59	
4	5 11		12	8 33		20	11 16		28	13 11	
5	5 38		13	8 56		21	11 33		29	13 21	
6	6 4		14	9 18		22	11 50		30	13 31	
7	6 30		15	9 40		23	12 5		31	13 40	
8	6 56		16	10 0		24	12 20				

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for
THURSO *add* 14 m. | GREENOCK *add* 19 m. | LIVERPOOL *add* 12 m.

JANUARY, 1899.

WEEK DAY.	MONTH DAY.	MOON'S TRANSIT.	PEMBROKE (H.M. Dockyard). APPROXIMATE {Rise 6 10, Fall 6 20} MORNING. Time H.M. / Height F.L.	AFTERNOON. Time H.M. / Height F.L.	PORTISHEAD (Dock entr.). APPROXIMATE {Rise 5 40, Fall 6 40} MORNING. Time H.M. / Height F.L.	AFTERNOON. Time H.M. / Height F.L.	HOLYHEAD (Pier). APPROXIMATE {Rise 6 20, Fall 6 0} MORNING. Time H.M. / Height F.L.	AFTERNOON. Time H.M. / Height F.L.
S.	1	3m 3	8 36 20 6	8 53 20 4	9 30 38 6	9 46 38 3	0 15 14 9	0 33 14 8
M.	2	3 44	9 9 20 1	9 25 19 10	10 2 37 10	10 18 37 6	0 52 14 6	1 11 14 4
Tu.	3	4 25	9 42 19 6	10 0 19 2	10 34 37 10	10 51 36 5	1 31 14 1	1 51 13 11
W.	4	5 8	10 18 18 10	10 37 18 6	11 8 35 8	11 27 34 9	2 12 13 8	2 33 13 6
Th.	5	5 52	10 57 18 0	11 19 17 7	11 48 33 11	—	2 57 13 3	3 25 13 0
F.	6	6 40	11 46 17 4	—	0 12 33 2	0 41 32 7	3 56 12 10	4 30 12 9
S.	7	7 32	0 18 17 3	0 55 17 3	1 16 32 4	1 55 32 6	5 8 12 9	5 45 12 11
S.	8	8 29	1 36 17 6	2 19 17 11	2 36 33 0	3 19 34 0	6 21 13 1	6 56 13 5
M.	9	9 31	3 0 18 7	3 38 19 5	4 2 35 3	4 41 36 8	7 30 13 9	8 1 14 2
Tu.	10	10 35	4 12 20 3	4 42 21 5	5 16 38 3	5 47 39 7	8 30 14 8	8 56 15 2
W.	11	11 40	5 15 21 0	5 43 22 5	6 16 40 10	6 44 42 0	9 21 15 8	9 46 16 0
Th.	12	0 a. 41	6 10 23 0	6 36 23 5	7 11 43 1	7 36 43 10	10 11 16 4	10 35 16 7
F.	13	1 39	7 1 23 8	7 24 23 10	8 0 44 3	8 23 44 4	10 57 16 9	11 19 16 10
S.	14	2 33	7 46 23 10	8 8 23 9	8 45 44 4	9 7 44 2	11 41 16 9	—
S.	15	3 24	8 30 23 5	8 52 23 1	9 28 43 9	9 49 43 2	0 5 16 8	0 29 16 6
M.	16	4 13	9 14 22 6	9 35 21 10	10 9 42 8	10 28 41 2	0 53 16 2	1 17 15 10
Tu.	17	5 1	9 55 21 2	10 14 20 5	10 47 39 11	11 5 38 7	1 41 15 4	2 4 14 11
W.	18	5 49	10 33 19 10	10 53 18 10	11 24 36 11	11 44 35 3	2 27 14 5	2 51 13 11
Th.	19	6 38	11 15 18 0	11 41 17 3	—	0 6 33 10	3 17 13 5	3 48 13 0
F.	20	7 28	—	0 12 16 8	0 35 32 5	1 9 31 4	4 22 12 8	5 0 12 4
S.	21	8 18	0 49 16 4	1 31 16 3	1 49 30 10	2 32 30 8	5 39 12 3	6 18 12 4
S.	22	9 9	2 15 16 5	2 57 16 9	3 16 31 0	4 0 31 10	6 56 12 5	7 31 12 7
M.	23	9 59	3 34 17 2	4 5 17 9	4 39 32 8	5 11 33 9	8 2 12 10	8 28 13 2
Tu.	24	10 47	4 33 18 4	4 58 18 11	5 38 34 9	6 3 35 8	8 51 13 6	9 12 13 10
W.	25	11 34	5 21 19 2	5 43 19 10	6 24 36 6	6 44 37 4	9 30 14 2	9 48 14 5
Th.	26	m.	6 3 20 3	6 21 20 8	7 3 38 1	7 21 38 11	10 5 14 8	10 22 14 11
F.	27	0 19	6 38 21 0	6 54 21 3	7 38 39 6	7 54 39 11	10 37 15 1	10 51 15 3
S.	28	1 2	7 9 21 6	7 24 21 7	8 9 40 2	8 24 40 4	11 5 15 4	11 19 15 5
S.	29	1 43	7 39 21 8	7 54 21 8	8 39 40 4	8 54 40 5	11 34 15 5	11 50 15 5
M.	30	2 25	8 9 21 8	8 25 21 6	9 9 40 4	9 23 40 3	—	0 6 15 4
Tu.	31	3 6	8 41 21 4	8 57 21 1	9 37 40 0	9 52 39 7	0 23 15 3	0 40 15 2

Half mean spring range.	11ft. 3in.	21ft. 0in.	8ft. 0in.

Phases of the moon.

	D.	H.	M.	
Last Quarter -	5	3	22	Morning.
New -	11	10	50	Afternoon.
First Quarter -	18	4	36	Afternoon.
Full -	26	7	34	Afternoon.
In Perigee -	12	2		Morning.
In Apogee -	25	6		Afternoon.

Moon's declination at noon.

M.D.	o '	M.D.	o '	M.D.	o '	M.D.	o '
1	7 N.42	9	24 S.43	17	9 N.50	25	20 N.39
2	2 47	10	24 17	18	14 42	26	17 24
3	2 S.19	11	22 5	19	18 45	27	13 26
4	7 26	12	18 18	20	21 50	28	8 56
5	12 22	13	13 18	21	23 51	29	4 5
6	16 53	14	7 34	22	24 43	30	0 S.58
7	20 41	15	1 34	23	24 26	31	6 3
8	23 25	16	4 N.20	24	23 3		

The times of high water are given for Mean time at place : if Greenwich or Railway time be required,—for PEMBROKE *add* 20 m. | PORTISHEAD *add* 11 m. | HOLYHEAD *add* 18 m.

JANUARY, 1899.

Week Day	Month Day	KINGSTOWN (Watering pier.) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	BELFAST (New dock.) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	LONDONDERRY (Ship bridge.) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	D's Age at Noon D.
S.	1	1 18	10 1	1 36	10 0	0 55	9 0	1 13	8 11	10 15	6 8	10 32	6 7	19·0
M.	2	1 54	9 11	2 12	9 10	1 32	8 11	1 52	8 10	10 50	6 6	11 10	6 5	20·0
Tu.	3	2 31	9 9	2 51	9 8	2 12	8 9	2 33	8 8	11 33	6 3	11 59	6 1	21·0
W.	4	3 11	9 7	3 32	9 5	2 54	8 7	3 16	8 6	—	—	0 27	5 11	22·0
Th.	5	3 56	9 3	4 24	9 1	3 39	8 5	4 6	8 4	0 57	5 10	1 30	5 9	☽
F.	6	4 54	9 0	5 26	8 11	4 35	8 3	5 6	8 2	2 6	5 8	2 42	5 9	24·0
S.	7	5 59	8 11	6 33	9 0	5 40	8 1	6 15	8 1	3 18	5 10	3 52	6 0	25·0
S.	8	7 8	9 2	7 44	9 4	6 52	8 2	7 29	8 3	4 24	6 2	4 54	6 5	26·0
M.	9	8 20	9 7	8 54	9 10	8 4	8 5	8 36	8 8	5 21	6 8	5 48	6 10	27·0
Tu.	10	9 27	10 2	9 56	10 5	9 5	8 11	9 31	9 2	6 15	7 1	6 42	7 4	28·0
W.	11	10 21	10 8	10 45	10 11	9 57	9 4	10 22	9 6	7 9	7 6	7 36	7 9	●
Th.	12	11 9	11 2	11 33	11 4	10 47	9 8	11 12	9 8	8 1	7 11	8 25	8 1	0·6
F.	13	11 57	11 5	—	—	11 35	9 9	11 57	9 9	8 48	8 2	9 9	8 2	1·6
S.	14	0 21	11 5	0 45	11 4	0 20	9 9	—	—	9 29	8 1	9 51	8 0	2·6
S.	15	1 9	11 4	1 32	11 2	0 44	9 9	1 8	9 8	10 13	7 8	10 35	7 8	3·6
M.	16	1 55	11 0	2 18	10 9	1 32	9 7	1 56	9 6	10 57	7 5	11 21	7 2	4·6
Tu.	17	2 41	10 6	3 4	10 3	2 20	9 4	2 44	9 1	11 47	6 10	—	—	5·6
W.	18	3 26	10 0	3 50	9 9	3 8	8 11	3 33	8 8	0 15	6 6	0 46	6 2	☾
Th.	19	4 16	9 5	4 46	9 1	3 59	8 6	4 27	8 4	1 19	5 11	1 55	5 9	7·6
F.	20	5 18	8 10	5 52	8 9	4 59	8 2	5 34	8 0	2 33	5 7	3 11	5 6	8·6
S.	21	6 28	8 8	7 5	8 9	6 11	7 11	6 49	7 10	3 47	5 7	4 22	5 8	9·6
S.	22	7 43	8 10	8 20	8 11	7 27	7 10	8 4	7 11	4 55	5 10	5 25	5 11	10·6
M.	23	8 52	9 1	9 21	9 3	8 36	8 1	9 2	8 3	5 50	6 1	6 13	6 2	11·6
Tu.	24	9 48	9 5	10 11	9 7	9 25	8 5	9 46	8 7	6 35	6 4	6 57	6 6	12·6
W.	25	10 30	9 9	10 47	10 0	10 6	8 9	10 24	8 11	7 17	6 8	7 36	6 10	13·6
Th.	26	11 3	10 2	11 19	10 4	10 41	9 0	10 58	9 1	7 55	6 11	8 12	7 1	○
F.	27	11 35	10 5	11 51	10 6	11 14	9 1	11 29	9 2	8 27	7 2	8 42	7 3	15·6
S.	28	—	—	0 7	10 6	11 43	9 2	11 57	9 2	8 56	7 4	9 10	7 4	16·6
S.	29	0 22	10 7	0 37	10 6	—	—	0 12	9 3	9 24	7 3	9 38	7 3	17·6
M.	30	0 53	10 6	1 9	10 6	0 28	9 3	0 44	9 3	9 52	7 2	10 7	7 1	18·6
Tu.	31	1 26	10 5	1 43	10 4	1 1	9 3	1 18	9 2	10 22	7 0	10 38	6 11	19·6

Approximate — Kingstown { Rise 6 15 / Fall 6 0 }. Belfast { Rise 6 20 / Fall 6 0 }. Londonderry { Rise 6 15 / Fall 6 15 }.

Half mean spring range: Kingstown 5ft. 6in. — Belfast 4ft. 9in. — Londonderry 3ft. 10in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	3 47	Sub.	9	7 21	Sub.	17	10 20	Sub.	25	12 34	Sub.
2	4 15		10	7 46		18	10 40		26	12 47	
3	4 43		11	8 10		19	10 58		27	12 59	
4	5 11		12	8 33		20	11 16		28	13 11	
5	5 38		13	8 56		21	11 33		29	13 21	
6	6 4		14	9 18		22	11 50		30	13 31	
7	6 30		15	9 40		23	12 5		31	13 40	
8	6 56		16	10 0		24	12 20				

The times of high water are given for Mean time at place; if Dublin or Railway time be required.—for KINGSTOWN *subtract* 1 m. for Dublin time. | BELFAST *subtract* 2 m. | LONDONDERRY *add* 4 m.

JANUARY, 1899.

Week Day	Month Day	Moon's Transit	SLIGO BAY (Mullaghmore) Morning Time	Height F. L.	Afternoon Time	Height F. L.	GALWAY (Nimmo pier) Morning Time	Height F. L.	Afternoon Time	Height F. L.	QUEENSTOWN (Scott's wharf) Morning Time	Height F. L.	Afternoon Time	Height F. L.
			Rise 6 10 Fall 6 20				Rise 6 30 Fall 6 0				Rise 6 5 Fall 6 25			
S.	1	3m 3	7 39	9 10	7 57	9 8	7 2	13 3	7 19	13 1	7 25	10 9	7 42	10 8
M.	2	3 44	8 13	9 6	8 32	9 4	7 37	12 11	7 56	12 9	7 59	10 6	8 16	10 5
Tu.	3	4 25	8 52	9 2	9 14	9 0	8 16	12 6	8 36	12 2	8 33	10 3	8 50	10 4
W.	4	5 8	9 38	8 10	10 4	8 9	8 57	11 10	9 20	11 6	9 9	9 11	9 29	9 9
Th.	5	5 52	10 33	8 7	11 5	8 6	9 45	11 3	10 14	11 1	9 50	9 6	10 15	9 4
F.	6	6 40	11 38	8 5	—	—	10 46	11 0	11 23	11 0	10 45	9 3	11 21	9 3
S.	7	7 32	0 13	8 5	0 49	8 6	—	—	0 1	11	11 58	9 3	—	—
S.	8	8 29	1 26	8 8	2 3	8 11	0 38	11 4	1 14	11 8	0 36	9 4	1 16	9 7
M.	9	9 31	2 37	9 3	3 7	9 7	1 48	12 1	2 19	12 7	1 56	9 10	2 33	10 2
Tu.	10	10 35	3 34	10 0	4 0	10 5	2 49	13 2	3 18	13 8	3 6	10 7	3 36	11 0
W.	11	11 40	4 25	10 10	4 50	11 2	3 44	14 2	4 9	14 8	4 5	11 5	4 32	11 9
Th.	12	0a.41	5 15	11 6	5 40	11 9	4 34	15 2	4 59	15 6	4 59	12 0	5 26	12 3
F.	13	1 39	6 4	11 10	6 27	11 10	5 24	15 9	5 48	15 10	5 51	12 4	6 15	12 5
S.	14	2 33	6 50	11 9	7 13	11 6	6 11	15 10	6 34	15 9	6 38	12 6	7 0	12 5
S.	15	3 24	7 36	11 4	7 58	11 1	6 57	15 6	7 20	15 2	7 22	12 3	7 44	12 0
M.	16	4 13	8 20	10 9	8 42	10 4	7 43	14 9	8 6	14 3	8 5	11 9	8 25	11 5
Tu.	17	5 1	9 5	10 0	9 30	9 7	8 29	13 8	8 51	13 1	8 45	11 1	9 5	10 8
W.	18	5 49	9 56	9 3	10 25	8 11	9 14	12 5	9 38	11 10	9 25	10 3	9 46	9 11
Th.	19	6 38	10 57	8 7	11 31	8 4	10 6	11 4	10 39	10 10	9 9	9 6	10 38	9 2
F.	20	7 28	—	—	0 7	8 7	11 15	10 6	11 55	10 4	11 14	8 11	11 52	8 9
S.	21	8 18	0 44	8 1	1 22	8 0	—	—	0 35	10 4	—	—	0 32	8 9
S.	22	9 9	2 0	8 1	2 36	8 3	1 14	10 6	1 49	10 9	1 14	8 10	1 55	8 11
M.	23	9 59	3 7	8 6	3 33	8 9	2 19	11 0	2 45	11 4	2 31	9 1	3 2	9 4
Tu.	24	10 47	3 55	9 1	4 14	9 4	3 10	11 9	3 33	12 1	3 28	9 8	3 51	9 11
W.	25	11 34	4 32	9 8	4 50	9 11	3 52	12 5	4 10	12 2	4 12	10 2	4 32	10 5
Th.	26	m.	5 8	10 2	5 26	10 4	4 28	13 1	4 45	13 5	4 51	10 8	5 9	10 10
F.	27	0 19	5 43	10 6	5 59	10 8	5 1	13 8	5 17	13 11	5 27	11 0	5 44	11 2
S.	28	1 2	6 14	10 9	6 28	10 9	5 33	14 1	5 48	14 2	6 0	11 3	6 15	11 4
S.	29	1 43	6 43	10 9	6 58	10 9	6 3	14 2	6 18	14 3	6 30	11 4	6 45	11 5
M.	30	2 25	7 14	10 7	7 30	10 5	6 34	14 2	6 51	14 0	7 0	11 4	7 16	11 2
Tu.	31	3 6	7 46	10 3	8 2	10 1	7 8	13 10	7 25	13 8	7 32	11 2	7 48	11 0

Half mean spring range: SLIGO 5ft. 7in.   GALWAY 7ft. 5in.   QUEENSTOWN 5ft. 10in.

Phases of the moon.

	D.	H.	M.	
Last Quarter	5	3	22	Morning.
New	11	10	50	Afternoon.
First Quarter	18	4	36	Afternoon.
Full	26	7	34	Afternoon.
In Perigee	12	2		Morning.
In Apogee	25	6		Afternoon.

Moon's declination at noon.

M.D.	o	'	M.D.	o	'	M.D.	o	'	M.D.	o	'
1	7 N.42		9	24 S.43		17	9 N.50		25	20 N.39	
2	2	47	10	24	17	18	14	42	26	17	24
3	2 S.19		11	22	5	19	18	45	27	13	26
4	7	26	12	18	18	20	21	50	28	8	56
5	12	22	13	13	18	21	23	51	29	4	5
6	16	53	14	7	34	22	24	43	30	0 S.58	
7	20	41	15	1	34	23	24	26	31	6	3
8	23	25	16	4 N.20		24	23	3			

The times of high water are given for Mean time at place; if Dublin or Railway time be required,—for SLIGO BAY *add 9 m.* | GALWAY *add 11 m.* | QUEENSTOWN *add 8 m.*

JANUARY, 1899.

WATERFORD (*Duncannon fort*).

APPROXIMATE - { RISE 6 5 / FALL 6 20

WEEK DAY.	MONTH DAY.	MORNING. Time. H. M.	Height. F. I.	AFTERNOON. Time. H. M.	Height. F. I.	MORNING. Time. H. M.	Height. F. I.	AFTERNOON. Time. H. M.	Height. F. I.	MORNING. Time. H. M.	Height. F. I.	AFTERNOON. Time. H. M.	Height. F. I.	☾'s AGE AT NOON. D.
S.	1	7 46	11 7	8 2	11 7									19·0
M.	2	8 18	11 6	8 34	11 5									20·0
Tu.	3	8 50	11 3	9 7	11 1									21·0
W.	4	9 24	10 11	9 43	10 9									22·0
Th.	5	10 8	10 6	10 37	10 3									☾
F.	6	11 8	10 1	11 40	10 0									24·0
S.	7	—	—	0 14	9 11									25·0
S.	8	0 49	10 1	1 26	10 4									26·0
M.	9	2 5	10 8	2 44	11 0									27·0
Tu.	10	3 21	11 4	3 54	11 9									28·0
W.	11	4 24	12 1	4 53	12 5									●
Th.	12	5 21	12 8	5 47	12 10									0·6
F.	13	6 11	13 0	6 35	13 1									1·6
S.	14	6 58	13 2	7 21	13 2									2·6
S.	15	7 43	13 1	8 5	12 11									3·6
M.	16	8 26	12 8	8 45	12 5									4·6
Tu.	17	9 3	12 1	9 21	11 8									5·6
W.	18	9 40	11 3	10 2	10 11									☽
Th.	19	10 29	10 6	11 0	10 1									7·6
F.	20	11 34	9 9	—	—									8·6
S.	21	0 9	9 6	0 46	9 6									9·6
S.	22	1 25	9 6	2 4	9 8									10·6
M.	23	2 40	9 11	3 13	10 2									11·6
Tu.	24	3 43	10 5	4 9	10 8									12·6
W.	25	4 32	10 11	4 54	11 2									13·6
Th.	26	5 14	11 4	5 32	11 6									○
F.	27	5 49	11 8	6 5	11 10									15·6
S.	28	6 20	11 11	6 35	12 0									16·6
S.	29	6 50	12 0	7 5	12 1									17·6
M.	30	7 21	12 2	7 37	12 1									18·6
Tu.	31	7 53	12 0	8 8	11 11									19·6

Half mean spring range } 6ft. 2in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	3 47	Sub.	9	7 21	Sub.	17	10 20	Sub.	25	12 34	Sub.
2	4 15		10	7 46		18	10 40		26	12 47	
3	4 43		11	8 10		19	10 58		27	12 59	
4	5 11		12	8 33		20	11 16		28	13 11	
5	5 38		13	8 56		21	11 33		29	13 21	
6	6 4		14	9 18		22	11 50		30	13 31	
7	6 30		15	9 40		23	12 5		31	13 40	
8	6 56		16	10 0		24	12 20				

The times of high water are given for Mean time at place; if Dublin or Railway time be required,—for WATERFORD *add* 3 m.

FEBRUARY, 1899.

Week Day	Month Day	Moon's Transit H.M.	BREST (Entr. of Dockyard basin). Morning Time H.M.	Height F. I.	BREST Afternoon Time H.M.	Height F. I.	DEVONPORT (H.M. Dockyard) High Water Morning Time H.M.	Height F. I.	High Water Afternoon Time H.M.	Height F. I.	Low Water Morning Time H.M.	Height F. I.	Low Water Afternoon Time H.M.	Height F. I.
W.	1	3m50	6 46	17 4	7 4	16 10	8 38	14 3	8 53	13 9	2 37	1 10	2 52	1 9
Th.	2	4 35	7 23	16 5	7 43	15 10	9 13	8	9 26	13 4	3 7	2 4	3 22	2 7
F.	3	5 24	8 5	15 3	8 29	14 7	9 45	13 1	10 8	12 10	3 38	3 0	3 56	3 5
S.	4	6 17	8 58	14 1	9 32	13 9	10 34	12 7	11 4	12 6	4 18	3 9	4 45	4 1
S.	5	7 14	10 14	13 8	11 1	13 9	11 38	12 1	—	—	5 18	4 2	5 54	4 8
M.	6	8 15	11 48	14 0	—		0 17	12 4	1 2	12 1	6 33	4 6	7 16	4 8
Tu.	7	9 18	0 33	14 7	1 12	15 5	1 49	12 11	2 33	12 9	8 2	3 8	8 48	3 7
W.	8	10 20	1 46	16 4	2 16	17 4	3 15	13 11	3 54	13 10	9 32	2 4	10 10	2 3
Th.	9	11 19	2 43	18 4	3 7	19 3	4 27	15 2	4 55	14 10	10 42	0 9	11 10	1 0
F.	10	0a16	3 30	19 11	3 53	20 5	5 22	16 1	5 48	15 6	11 37	*0 6	—	
S.	11	1 9	4 16	20 9	4 38	20 11	6 13	16 9	6 37	16 1	0 3	0 1	0 28	*1 1
S.	12	2 1	4 59	21 0	5 20	20 10	7 0	16 11	7 21	16 2	0 52	*0 8	1 15	*1 5
M.	13	2 51	5 40	20 6	5 59	20 1	7 41	16 8	8 0	15 11	1 37	*0 6	1 57	*1 0
Tu.	14	3 41	6 18	19 6	6 37	18 11	8 19	16 0	8 38	15 4	2 16	*0 3	2 35	*0 3
W.	15	4 31	6 56	18 1	7 16	17 2	8 55	15 1	9 11	14 6	2 53	0 7	3 9	0 11
Th.	16	5 22	7 38	16 3	8 0	15 4	9 28	14 0	9 46	13 6	3 25	1 7	3 41	2 3
F.	17	6 13	8 23	14 5	8 51	13 6	10 6	12 11	10 27	12 6	3 57	2 10	4 15	3 7
S.	18	7 4	9 24	13 0	10 4	12 6	10 51	11 10	11 19	11 9	4 37	4 1	5 4	4 11
S.	19	7 54	10 47	12 4	11 33	12 5	11 56	11 1	—	—	5 36	5 1	6 14	5 9
M.	20	8 43	—		0 17	12 8	0 39	11 6	1 22	11 2	6 54	5 2	7 36	5 6
Tu.	21	9 31	0 57	13 2	1 31	13 8	2 4	12 11	2 43	11 8	8 19	4 4	9 0	4 8
W.	22	10 16	2 0	14 5	2 22	15 2	3 19	12 11	3 51	12 6	9 37	3 3	10 8	3 8
Th.	23	11 0	2 41	15 10	2 59	16 6	4 17	13 10	4 40	13 3	10 33	2 3	10 56	2 7
F.	24	11 42	3 15	17 2	3 30	17 8	5 1	14 6	5 20	13 11	11 16	1 3	11 35	1 10
S.	25	m.	3 45	18 1	4 0	18 5	5 38	15 0	5 55	14 5	11 53	0 8	—	
S.	26	0 24	4 15	18 8	4 30	18 10	6 11	15 4	6 27	14 10	0 10	1 1	0 26	0 1
M.	27	1 6	4 45	19 0	5 0	19 1	6 43	15 6	6 59	15 1	0 42	0 7	0 58	0 0
Tu.	28	1 49	5 15	19 0	5 30	18 10	7 14	15 5	7 28	14 11	1 14	0 7	1 29	0 2

Half mean spring range.   BREST 9ft. 6in.   DEVONPORT 7ft. 9in.

Phases of the moon.

	D.	H.	M.	
Last Quarter -	3	5	24	Afternoon.
New - - - -	10	9	32	Morning.
First Quarter -	17	8	52	Morning.
Full - - - -	25	2	16	Afternoon.
In Perigee - -	9	2		Afternoon.
In Apogee - -	22	2		Morning.

Moon's declination at noon.

M.D.	° ′	M.D.	° ′	M.D.	° ′	M.D.	° ′
1	10 S. 59	9	15 S. 49	17	23 N. 14	25	5 N. 25
2	15 32	10	10 23	18	24 27	26	0 23
3	19 28	11	4 23	19	24 29	27	4 S. 43
4	22 30	12	1 N. 44	20	23 24	28	9 42
5	24 18	13	7 36	21	21 18		
6	24 36	14	12 54	22	18 17		
7	23 14	15	17 22	23	14 32		
8	20 14	16	20 51	24	10 11		

FEBRUARY, 1899.

		PORTSMOUTH (H.M. Dockyard).								DOVER (North pier).				
		High Water. APPROXIMATE - {Rise 7 20 / Fall 5 10}				Low Water.				APPROXIMATE - {Rise 5 0 / Fall 7 30}				AGE OF ☽ AT NOON.
WEEK DAY.	MONTH DAY.	MORNING.	AFTERNOON.	MORNING.	AFTERNOON.					MORNING.	AFTERNOON.			D.
		Time / Height	Time / Height	Time / Height	Time / Height					Time / Height	Time / Height			
		H. M. F. I.	H. M. F. I.	H. M. F. I.	H. M. F. I.					H. M. F. I.	H. M. F. I.			
W.	1	2 30 12 9	2 47 12 7	7 26 1 2	7 43 1 5					2 10 17 9	2 28 17 6			20·6
Th.	2	3 5 12 4	3 23 12 1	8 1 1 9	8 20 2 0					2 46 17 2	3 4 16 10			21·6
F.	3	3 42 11 10	4 3 11 7	8 42 2 5	9 7 2 10					3 23 16 5	3 44 16 0			☾
S.	4	4 26 11 3	4 54 11 0	9 36 3 3	10 11 3 7					4 7 15 6	4 33 15 0			23·6
S.	5	5 27 10 9	6 6 10 7	10 50 3 9	11 35 3 9					5 3 14 7	5 38 14 4			24·6
M.	6	6 50 10 6	7 36 10 9	— —	0 24 3 8					6 18 14 4	7 2 14 8			25·6
Tu.	7	8 22 11 2	9 3 11 7	1 10 3 4	1 49 2 9					7 46 15 3	8 26 15 11			26·6
W.	8	9 38 12 1	10 10 12 8	2 22 2 2	2 51 1 6					9 1 16 8	9 33 17 2			27·6
Th.	9	10 38 13 2	11 3 13 6	3 18 0 11	3 44 0 4					10 2 18 2	10 29 18 9			28·6
F.	10	11 26 13 10	11 49 14 2	4 9 *0 1	4 32 *0 5					10 55 19 3	11 20 19 8			●
S.	11	— —	0 12 14 4	4 54 *0 8	5 16 *0 11					11 45 20 0	— —			1·1
S.	12	0 35 14 6	0 58 14 5	5 37 *1 0	5 58 *1 0					0 9 20 2	0 32 20 3			2·1
M.	13	1 20 14 4	1 41 14 2	6 18 *0 10	6 38 *0 8					0 55 20 2	1 17 19 11			3·1
Tu.	14	2 1 13 11	2 20 13 8	6 57 *0 5	7 16 0 0					1 38 19 7	1 58 19 3			4·1
W.	15	2 38 13 5	2 57 13 0	7 34 0 6	7 52 1 1					2 18 18 9	2 38 18 2			5·1
Th.	16	3 17 12 6	3 37 12 0	8 12 1 7	8 35 2 2					2 58 17 5	3 18 16 9			6·1
F.	17	3 58 11 7	4 20 11 2	9 1 2 9	9 30 3 4					3 39 16 0	4 1 15 3			☽
S.	18	4 47 10 8	5 19 10 4	10 3 3 10	10 41 4 2					4 26 14 7	4 56 13 11			8·1
S.	19	5 57 10 0	6 38 9 10	11 24 4 4	—					5 31 13 6	6 9 13 3			9·1
M.	20	7 22 9 11	8 5 10 1	0 10 4 5	0 56 4 3					6 50 13 4	7 31 13 8			10·1
Tu.	21	8 46 10 5	9 23 10 9	1 36 3 11	2 10 3 5					8 11 14 1	8 46 14 7			11·1
W.	22	9 52 11 1	10 15 11 5	2 40 3 0	3 5 2 6					9 15 15 1	9 38 15 8			12·1
Th.	23	10 36 11 10	10 55 12 2	3 25 2 1	3 44 1 8					9 59 16 2	10 19 16 8			13·1
F.	24	11 11 12 5	11 26 12 8	4 1 1 4	4 17 1 1					10 37 17 1	10 54 17 6			14·1
S.	25	11 41 12 11	11 56 13 1	4 32 0 10	4 47 0 7					11 11 17 10	11 28 18 1			○
S.	26	—	0 12 13 3	5 1 0 5	5 15 0 3					11 44 18 4	mid. 18 6			16·1
M.	27	0 28 13 5	0 44 13 6	5 29 0 2	5 44 0 1					—	0 16 18 7			17·1
Tu.	28	1 0 13 5	1 16 13 4	5 59 0 1	6 14 0 1					0 33 18 8	0 50 18 8			18·1

Half mean spring range }   6ft. 9in.   9ft. 4in.

Equation of time at noon.

M.D.	M. S.	Sub.	M.D.	M. S.	Sub.	M.D.	M. S.	Sub.	M.D.	M. S.	Sub.
1	13 48	Sub.	9	14 26	Sub.	17	14 13	Sub.	25	13 15	Sub.
2	13 56		10	14 27		18	14 8		26	13 5	
3	14 3		11	14 27		19	14 3		27	12 54	
4	14 8		12	14 27		20	13 56		28	12 43	
5	14 13		13	14 26		21	13 49				
6	14 18		14	14 24		22	13 42				
7	14 21		15	14 21		23	13 33				
8	14 24		16	14 17		24	13 25				

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for PORTSMOUTH *add* 4 m. | DOVER *subtract* 5 m.
* Below zero, or datum to which soundings on charts are reduced.

FEBRUARY, 1899.

Sheerness (H.M. Dockyard) — Approximate: Rise 6 5, Fall 6 25. Half mean spring range 8 ft. 0 in.
Chatham (H.M. Dockyard) — Approximate: Rise 6 35, Fall 6 5. Half mean spring range 9 ft. 1 in.

Tide cells are given as **time (H. M.) / height (F. I.)**. Afternoon times are p.m. `*` = below zero.

Week Day	Month Day	Moon's Transit	Sheerness Morning	Sheerness Afternoon	Chatham High Water Morning	Chatham High Water Afternoon	Chatham Low Water Morning	Chatham Low Water Afternoon
W.	1	3 50	3 43 / 15 4	4 0 / 15 2	3 50 / 17 2	4 6 / 17 0	10 2 / 1 2	10 15 / 1 3
Th.	2	4 35	4 17 / 15 0	4 35 / 14 9	4 23 / 16 9	4 40 / 16 6	10 29 / 1 5	10 45 / 1 8
F.	3	5 24	4 53 / 14 6	5 13 / 14 2	4 58 / 16 2	5 17 / 15 9	11 1 / 1 1	11 19 / 2 3
S.	4	6 17	5 37 / 13 10	6 4 / 13 6	5 39 / 15 4	6 5 / 15 0	11 40 / 2 9	—
S.	5	7 14	6 35 / 13 3	7 12 / 13 0	6 37 / 14 8	7 15 / 14 6	0 6 / 3 2	0 38 / 3 5
M.	6	8 15	7 55 / 13 0	8 41 / 13 1	7 58 / 14 5	8 44 / 14 5	1 20 / 3 4	2 9 / 3 1
Tu.	7	9 18	9 27 / 13 5	10 10 / 13 10	9 32 / 14 9	10 18 / 15 4	2 59 / 2 10	3 48 / 2 5
W.	8	10 20	10 48 / 14 4	11 20 / 14 10	10 57 / 16 0	11 29 / 16 7	4 31 / 2 0	5 9 / 1 7
Th.	9	11 19	11 49 / 15 4	—	11 56 / 17 2	—	5 42 / 1 1	6 13 / 0 7
F.	10	0 16 (noon)	0 15 / 15 1	0 40 / 16 1	0 21 / 17 10	0 46 / 18 5	6 41 / 0 3	7 7 / *0 1
S.	11	1 9	1 3 / 16 8	1 26 / 17 0	1 9 / 18 10	1 32 / 19 2	7 31 / *0 5	7 54 / *0 9
S.	12	2 1	1 48 / 17 2	2 10 / 17 3	1 55 / 19 5	2 16 / 19 6	8 17 / *1 0	8 39 / *1 1
M.	13	2 51	2 31 / 17 2	2 51 / 17 1	2 36 / 19 5	2 56 / 19 3	8 59 / *1 0	9 17 / *0 11
Tu.	14	3 41	3 10 / 16 11	3 29 / 16 8	3 16 / 19 0	3 36 / 18 8	9 34 / *0 8	9 51 / *0 4
W.	15	4 31	3 48 / 16 4	4 7 / 15 11	3 55 / 18 4	4 13 / 17 11	10 7 / 0 0	10 22 / 0 4
Th.	16	5 22	4 26 / 15 5	4 46 / 14 11	4 32 / 17 4	4 51 / 16 9	10 37 / 0 0	10 54 / 1 4
F.	17	6 13	5 8 / 14 4	5 32 / 13 10	5 12 / 16 0	5 34 / 15 4	11 14 / 1 1	11 35 / 2 8
S.	18	7 4	5 58 / 13 4	6 27 / 12 11	5 59 / 14 9	6 29 / 14 4	11 59 / 3 4	—
S.	19	7 54	7 3 / 12 6	7 45 / 12 4	7 7 / 13 11	7 49 / 13 8	0 30 / 3 10	1 11 / 4 0
M.	20	8 43	8 30 / 12 3	9 15 / 12 5	8 33 / 13 5	9 19 / 13 6	1 57 / 4 0	2 46 / 3 10
Tu.	21	9 31	9 56 / 12 8	10 34 / 13 0	10 3 / 13 10	10 43 / 14 3	3 34 / 3 8	4 18 / 3 5
W.	22	10 16	11 7 / 13 4	11 34 / 13 9	11 17 / 14 9	11 43 / 15 3	4 55 / 3 2	5 28 / 2 10
Th.	23	11 0	11 55 / 14 1	—	—	0 3 / 15 8	5 56 / 2 6	6 19 / 2 2
F.	24	11 42	0 14 / 14 5	0 31 / 14 9	0 21 / 16 1	0 38 / 16 6	6 40 / 1 10	6 58 / 1 7
S.	25	m.	0 48 / 15 1	1 3 / 15 4	0 54 / 16 11	1 9 / 17 3	7 14 / 1 4	7 30 / 1 4
S.	26	0 24	1 18 / 15 7	1 33 / 15 10	1 24 / 17 6	1 39 / 17 9	7 46 / 0 11	8 2 / 0 8
M.	27	1 6	1 48 / 15 11	2 3 / 16 0	1 54 / 17 11	2 9 / 18 0	8 17 / 0 6	8 32 / 0 5
Tu.	28	1 49	2 18 / 16 1	2 33 / 16 1	2 23 / 18 1	2 37 / 18 0	8 46 / 0 4	9 0 / 0 4

Phases of the moon.

	D.	H.	M.	
Last Quarter	3	5	24	Afternoon.
New	10	9	32	Morning.
First Quarter	17	8	52	Morning.
Full	25	2	16	Afternoon.
In Perigee	9	2		Afternoon.
In Apogee	22	2		Morning.

Moon's declination at noon.

M.D.	o	′	M.D.	o	′	M.D.	o	′	M.D.	o	′
1	10	8.59	9	15	8.49	17	23	N.14	25	5	N.25
2	15	32	10	10	23	18	24	27	26	0	23
3	19	28	11	4	23	19	24	29	27	4	S.43
4	22	30	12	1 N.	44	20	23	24	28	9	42
5	24	18	13	7	36	21	21	21			
6	24	36	14	12	54	22	18	17			
7	23	14	15	17	22	23	14	32			
8	20	14	16	20	51	24	10	11			

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for SHEERNESS subtract 3 m. | CHATHAM subtract 2 m.
* Below zero, or datum to which soundings on charts are reduced.

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LONDON (*London bridge*). Approximate — Rise 5 30, Fall 7 0.
HARWICH (*Angel quay*). Approximate — Rise 6 25, Fall 6 0.
HULL (*Victoria dock*). Approximate — Rise 5 40, Fall 6 30.

Week Day	Month Day	London Morn. Time (H. M.)	London Morn. Height (F. I.)	London Aft. Time	London Aft. Height	Harwich Morn. Time	Harwich Morn. Height	Harwich Aft. Time	Harwich Aft. Height	Hull Morn. Time	Hull Morn. Height	Hull Aft. Time	Hull Aft. Height	☽'s age at noon — D.
W.	1	5 5	20 0	5 21	19 10	3 1	11 0	3 18	10 11	9 36	19 6	9 53	19 2	20·6
Th.	2	5 38	19 6	5 55	19 2	3 35	10 9	3 52	10 7	10 11	18 10	10 29	18 5	21·6
F.	3	6 13	18 10	6 33	18 5	4 9	10 5	4 28	10 3	10 49	18 0	11 14	17 6	☾
S.	4	6 56	18 0	7 22	17 7	4 50	10 1	5 15	9 11	11 44	17 1	—	—	23·6
S.	5	7 52	17 4	8 26	17 2	5 45	9 10	6 20	9 9	0 19	16 8	0 56	16 4	24·6
M.	6	9 7	17 3	9 55	17 4	7 2	9 8	7 48	9 9	1 35	16 2	2 16	16 3	25·6
Tu.	7	10 43	17 7	11 25	18 0	8 34	9 11	9 17	10 2	2 57	16 8	3 38	17 6	26·6
W.	8	—	—	0 4	18 6	9 55	10	10 29	10 10	4 16	18 3	4 49	19 1	27·6
Th.	9	0 38	19 2	1 8	19 11	11 0	11 2	11 27	11 6	5 17	19 10	5 43	20 6	28·6
F.	10	1 35	20 5	2 0	20 10	11 52	11 9	—	—	6 8	21 1	6 33	21 7	●
S.	11	2 23	21 3	2 45	21 7	0 16	12 0	0 39	12 1	6 57	22 0	7 20	22 4	1·1
S.	12	3 7	21 11	3 28	22 0	1 1	12 2	1 23	12 3	7 43	22 6	8 4	22 6	2·1
M.	13	3 49	21 11	4 10	21 10	1 45	12 2	2 6	12 1	8 24	22 5	8 44	22 2	3·1
Tu.	14	4 31	21 8	4 52	21 5	2 27	11 11	2 47	11 9	9 4	21 9	9 24	21 2	4·1
W.	15	5 11	21 0	5 29	20 7	3 6	11 6	3 25	11 3	9 43	20 7	10 2	19 10	5·1
Th.	16	5 47	20 0	6 7	19 4	3 44	11 0	4 4	10 9	10 22	19 1	10 44	18 4	6·1
F.	17	6 28	18 4	6 51	18 0	4 24	10 5	4 45	10 1	11 9	17 7	11 38	16 10	☽
S.	18	7 15	17 5	7 42	16 11	5 9	9 10	5 38	9 7	—	—	0 11	16 2	8·1
S.	19	8 16	16 7	8 57	16 5	6 11	9 5	6 52	9 3	0 48	15 6	1 27	15 2	9·1
M.	20	9 42	16 5	10 29	16 6	7 36	9 3	8 21	9 4	2 6	15 1	2 46	15 3	10·1
Tu.	21	11 11	16 8	11 50	17 0	9 3	9 6	9 41	9 9	3 25	15 9	4 2	16 5	11·1
W.	22	—	—	0 24	17 5	10 15	10 0	10 43	10 3	4 35	16 10	5 2	17 5	12·1
Th.	23	0 52	17 11	1 14	18 5	11 6	10 5	11 25	10 8	5 24	17 11	5 42	18 5	13·1
F.	24	1 33	18 10	1 51	19 2	11 43	10 11	mid.	11	6 0	18 11	6 17	19 4	14·1
S.	25	2 8	19 6	2 23	19 9	—	—	0 16	11	6 33	19 8	6 49	20 0	○
S.	26	2 38	20 0	2 53	20 3	0 31	11 4	0 46	11 5	7 4	20 3	7 19	20 6	16·1
M.	27	3 7	20 6	3 21	20 7	1 0	11 5	1 15	11 6	7 34	20 8	7 49	20 9	17·1
Tu.	28	3 36	20 8	3 51	20 8	1 30	11 6	1 45	11 5	8 4	20 10	8 19	20 10	18·1

Half mean spring range: 10ft 4in.   5ft 9in.   10ft 5in.

Equation of time at noon.

M.D.	M.	S.	Sub.	M.D.	M.	S.	Sub.	M.D.	M.	S.	Sub.	M.D.	M.	S.	Sub.
1	13	48	Sub.	9	14	26	Sub.	17	14	13	Sub.	25	13	15	Sub.
2	13	56		10	14	27		18	14	8		26	13	5	
3	14	3		11	14	27		19	14	3		27	12	54	
4	14	8		12	14	27		20	13	56		28	12	43	
5	14	13		13	14	26		21	13	49					
6	14	18		14	14	24		22	13	42					
7	14	21		15	14	21		23	13	33					
8	14	24		16	14	17		24	13	25					

The times of high water are given for Mean time at place; if Greenwich or Railway time be required, — for LONDON 0 m. | HARWICH *subtract* 5 m. | HULL *add* 1 m.

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Week Day	Month Day	Moon's Transit (H. M.)	Sunderland (North dock). Approximate — Rise 6 5 / Fall 6 25 — Morning Time (H. M.)	Height (F. I.)	Afternoon Time (H. M.)	Height (F. I.)	North Shields (Low lighthouse). Approximate — Rise 5 10 / Fall 6 45 — Morning Time (H. M.)	Height (F. I.)	Afternoon Time (H. M.)	Height (F. I.)	Leith (East pier). Approximate — Rise 6 0 / Fall 6 15 — Morning Time (H. M.)	Height (F. I.)	Afternoon Time (H. M.)	Height (F. I.)
W.	1	3m50	6 26	13 3	6 45	13 0	6 30	13 6	6 48	13 3	5 24	15 1	5 43	14 10
Th.	2	4 35	7 5	12 9	7 25	12 6	7 13	12 9	7 26	12 9	6 3	14 7	6 23	14 3
F.	3	5 24	7 46	12 2	8 9	11 10	7 48	12 5	8 13	12 0	6 44	13 11	7 8	13 6
S.	4	6 17	8 35	11 6	9 6	11 3	8 41	11 8	9 15	11 4	7 36	13 1	8 9	12 9
S.	5	7 14	9 43	11 0	10 25	10 11	9 55	11 2	10 37	11 2	8 47	12 7	9 30	12 5
M.	6	8 15	11 8	10 11	11 51	11 2	11 20	11 4	—		10 14	12 7	10 57	12 10
Tu.	7	9 18	—		0 31	11 8	0 3	11 7	0 43	12 0	11 37	13 3	—	
W.	8	10 20	1 7	12 3	1 39	12 10	1 19	12 5	1 50	12 11	0 13	13 9	0 43	14 5
Th.	9	11 19	2 10	13 5	2 39	13 11	2 17	13 6	2 42	14 2	1 11	15 2	1 38	15 10
F.	10	0a16	3 5	14 5	3 28	14 10	3 5	14 8	3 27	15 1	2 3	16 2	2 26	16 11
S.	11	1 9	3 50	15 3	4 12	15 6	3 49	15 5	4 11	15 9	2 48	17 4	3 9	17 7
S.	12	2 1	4 33	15 8	4 53	15 8	4 33	15 10	4 55	15 9	3 30	17 8	3 51	17 7
M.	13	2 51	5 13	15 6	5 33	15 4	5 17	15 7	5 38	15 4	4 12	17 5	4 33	17 2
Tu.	14	3 41	5 53	14 11	6 13	14 6	5 59	15 0	6 19	14 8	4 53	16 10	5 13	16 5
W.	15	4 31	6 34	14 1	6 55	13 6	6 38	14 3	6 58	13 10	5 33	16 0	5 53	15 5
Th.	16	5 22	7 17	13 0	7 40	12 5	7 19	13 3	7 42	12 8	6 15	14 10	6 38	14 2
F.	17	6 13	8 4	11 10	8 29	11 4	8 12	11 8	8 36	11 6	7 3	13 6	7 30	12 11
S.	18	7 4	8 58	10 10	9 34	10 5	9 8	11 0	9 46	10 7	8 1	12 5	8 38	11 11
S.	19	7 54	10 16	10 2	10 58	10 0	10 26	10 5	11 8	10 4	9 20	11 8	10 3	11 7
M.	20	8 43	11 40	10 2	—		11 51	10 6	—		10 45	11 8	11 24	11 10
Tu.	21	9 31	0 18	10 4	0 53	10 9	0 31	10 9	1 7	11 0	—		noon.	12 2
W.	22	10 16	1 25	11 1	1 53	11 6	1 38	11 4	2 3	11 8	0 31	12 6	0 57	13 0
Th.	23	11 0	2 16	12 0	2 37	12 4	2 23	12 1	2 42	12 6	1 17	13 6	1 36	14 0
F.	24	11 42	2 56	12 8	3 13	13 0	2 59	12 11	3 14	13 3	1 54	14 6	2 10	14 11
S.	25	m.	3 28	13 4	3 42	13 8	3 28	13 7	3 42	13 11	2 25	15 4	2 40	15 7
S.	26	0 24	3 56	13 11	4 10	14 1	3 56	14 2	4 11	14 4	2 55	15 8	3 9	16 1
M.	27	1 6	4 25	14 3	4 40	14 4	4 26	14 5	4 41	14 6	3 23	16 2	3 37	16 3
Tu.	28	1 49	4 55	14 5	5 10	14 4	4 56	14 5	5 12	14 4	3 52	16 2	4 7	16 1

	Sunderland	North Shields	Leith
Half mean spring range.	7ft. 2in.	7ft. 4in.	8ft. 2in.

Phases of the moon.

	D.	H.	M.	
Last Quarter -	3	5	24	Afternoon.
New - - - -	10	9	32	Morning.
First Quarter -	17	8	52	Morning.
Full - - - -	25	2	16	Afternoon.
In Perigee - -	9	2		Afternoon.
In Apogee - -	22	2		Morning.

Moon's declination at noon.

M.D.	° '	M.D.	° '	M.D.	° '	M.D.	° '
1	10 S.59	9	15 S.49	17	23 N.14	25	5 N.25
2	15 32	10	10 23	18	24 27	26	0 23
3	19 28	11	4 23	19	24 29	27	4 S.43
4	22 30	12	1 N.44	20	23 24	28	9 42
5	24 18	13	7 36	21	21 18		
6	24 36	14	12 54	22	18 17		
7	23 14	15	17 22	23	14 32		
8	20 14	16	20 51	24	10 11		

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for SUNDERLAND add 5 m.   NORTH SHIELDS add 6 m.   LEITH add 13 m.

FEBRUARY, 1899.

Approximate — THURSO (near Scrabster pier): RISE 6 30, FALL 6 0 · GREENOCK (East dock): RISE 6 30, FALL 6 0 · LIVERPOOL (George pier): RISE 5 85, FALL 6 50

Week Day	Month Day	Thurso Morn Time (H.M.)	Ht (F.I.)	Thurso Aftn Time	Ht	Greenock Morn Time	Ht	Greenock Aftn Time	Ht	Liverpool Morn Time	Ht	Liverpool Aftn Time	Ht	Moon's age at noon
W.	1	11 34	11 8	11 54	11 4½	2 56	9 5	3 12	9 4	2 6	24 9	2 23	25 3	20·6
Th.	2	—	—	0 14	11 1	3 29	9 3½	3 46	9 1	2 40	23 10	2 57	24 1	21·6
F.	3	0 36	10 9	1 0	10 4	4 5	9 0	4 27	8 10	3 16	22 11	3 38	22 8	☾
S.	4	1 27	10 0	2 0	9 9	4 51	8 8	5 19	8 6	4 4	22 0	4 34	21 3	23·6
Su.	5	2 39	9 6	3 24	9 4	5 52	8 4	6 32	8 3	5 11	21 1	5 55	20 4	24·6
M.	6	4 11	9 5	4 58	9 7	7 16	8 2	8 1	8 3	6 43	21 3	7 31	21 1	25·6
Tu.	7	5 40	9 11	6 15	10 6	8 45	8 6	9 26	8 9	8 14	22 8	8 51	22 6	26·6
W.	8	6 44	11 2	7 9	12 0	9 59	9 0	10 30	9 3	9 23	24 8	9 51	24 7	27·6
Th.	9	7 31	12 9	7 53	13 5	10 59	9 6	11 26	9 9	10 16	26 10	10 40	26 7	28·6
F.	10	8 15	14 0	8 36	14 4	11 51	9 11	—	—	11 4	28 6	11 28	27 9	●
S.	11	8 57	14 6	9 18	14 8	0 16	10 1	0 40	10 3	11 51	29 9	—	—	1·1
Su.	12	9 39	14 7	10 0	14 5	1 3	10 4	1 25	10 5	0 14	28 7	0 36	30 2	2·1
M.	13	10 21	14 2	10 42	13 9	1 46	10 4	2 6	10 5	0 57	28 6	1 17	29 7	3·1
Tu.	14	11 3	13 4	11 24	12 10	2 26	10 2	2 45	10 0	1 36	27 7	1 55	28 3	4·1
W.	15	11 45	12 3	—	—	3 3	9 10	3 21	9 7	2 14	26 1	2 32	26 2	5·1
Th.	16	0 7	11 7	0 30	11 0	3 40	9 4	4 4	9 1	2 51	24 4	3 12	23 11	6·1
F.	17	0 55	10 5	1 22	9 10	4 22	8 10	4 45	8 7	3 33	22 6	3 57	21 10	☽
S.	18	1 52	9 5	2 30	8 10	5 12	8 4	5 44	8 1	4 26	20 6	5 2	19 11	8·1
Su.	19	3 14	8 7	4 0	8 5	6 22	7 11	7 3	7 9	5 45	19 2	6 30	19 3	9·1
M.	20	4 45	8 5	5 26	8 6	7 48	7 9	8 30	7 10	7 15	19 8	7 58	19 8	10·1
Tu.	21	6 2	8 10	6 32	9 3	9 9	8 0	9 44	8 2	8 37	20 10	9 10	20 7	11·1
W.	22	6 57	9 9	7 16	10 4	10 13	8 4	10 36	8 7	9 36	22 1	9 57	22 5	12·1
Th.	23	7 32	10 11	7 47	11 5	10 56	8 9	11 16	8 11	10 16	23 6	10 33	23 9	13·1
F.	24	8 1	11 11	8 15	12 4	11 34	9 1	11 51	9 2	10 49	24 9	11 5	24 10	14·1
S.	25	8 29	12 8	8 43	12 10	—	—	0 7	9 4	11 20	26 0	11 35	25 7	○
Su.	26	8 57	13 0	9 11	13 2	0 23	9 6	0 39	9 7	11 50	26 9	—	—	16·1
M.	27	9 26	13 3	9 41	13 3	0 55	9 8	1 11	9 8	0 5	26 3	0 20	27 4	17·1
Tu.	28	9 56	13 1	10 12	12 11	1 27	9 9	1 42	9 9	0 36	26 10	0 52	27 4	18·1

Half mean spring range: Thurso 6ft. 7in. — Greenock 4ft. 10in. — Liverpool 13ft. 9in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	13 48	Sub.	9	14 26	Sub.	17	14 13	Sub.	25	13 15	Sub.
2	13 56		10	14 27		18	14 8		26	13 5	
3	14 3		11	14 27		19	14 3		27	12 54	
4	14 8		12	14 27		20	13 56		28	12 43	
5	14 13		13	14 26		21	13 49				
6	14 18		14	14 24		22	13 42				
7	14 21		15	14 21		23	13 33				
8	14 24		16	14 17		24	13 25				

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for THURSO *add* 14 m. | GREENOCK *add* 19 m. | LIVERPOOL *add* 12 m.

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Approximate tide data:
- PEMBROKE (H.M. Dockyard). Approximate — Rise 6 10, Fall 6 20.
- PORTISHEAD (Dock entr.). Approximate — Rise 5 40, Fall 6 40.
- HOLYHEAD (Pier). Approximate — Rise 6 20, Fall 6 0.

Week Day	M.D.	Moon's Transit H.M.	Pembroke Morn. Time H.M.	Pembroke Morn. Height F.I.	Pembroke Aft. Time H.M.	Pembroke Aft. Height F.I.	Portishead Morn. Time H.M.	Portishead Morn. Height F.I.	Portishead Aft. Time H.M.	Portishead Aft. Height F.I.	Holyhead Morn. Time H.M.	Holyhead Morn. Height F.I.	Holyhead Aft. Time H.M.	Holyhead Aft. Height F.I.
W.	1	3 m 50	9 14	20 9	9 31	20 4	10 8	39 0	10 24	38 4	0 58	15 0	1 17	14 8
Th.	2	4 35	9 48	19 11	10 6	19 5	10 40	37 8	10 57	36 9	1 36	14 5	1 56	14 1
F.	3	5 24	10 25	18 10	10 47	18 3	11 15	35 7	11 36	34 3	2 17	13 10	2 41	13 6
S.	4	6 17	11 11	17 8	11 40	17 2	—	—	noon.	33 2	3 8	13 1	3 41	12 10
S.	5	7 14	—	—	0 15	16 11	0 32	32 3	1 12	31 8	4 20	12 7	5 3	12 6
M.	6	8 15	0 57	16 11	1 46	17 2	1 58	31 9	2 47	32 6	5 48	12 8	6 31	12 11
Tu.	7	9 18	2 36	17 10	3 19	18 9	3 36	33 10	4 22	35 6	7 11	13 4	7 47	13 10
W.	8	10 2c	3 56	19 11	4 30	20 10	5 0	37 4	5 34	39 2	8 18	14 5	8 47	15 0
Th.	9	11 19	5 1	21 9	5 30	22 7	6 4	40 6	6 31	42 2	9 12	15 7	9 36	16 1
F.	10	0a16	5 56	23 3	6 20	23 10	6 56	43 6	7 20	44 7	9 59	16 6	10 21	16 10
S.	11	1 9	6 43	24 3	7 5	24 6	7 43	45 5	8 5	45 8	10 41	17 1	11 1	17 3
S.	12	2 1	7 26	24 7	7 46	24 5	8 26	45 7	8 46	45 3	11 21	17 3	11 42	17 1
M.	13	2 51	8 6	24 0	8 26	23 7	9 5	44 8	9 24	44 0	—	—	0 3	16 11
Tu.	14	3 41	8 46	23 0	9 5	22 5	9 42	43 1	9 59	42 0	0 24	16 7	0 45	16 2
W.	15	4 31	9 23	21 7	9 42	20 8	10 16	40 6	10 34	39 0	1 6	15 9	1 27	15 2
Th.	16	5 22	10 1	19 9	10 20	18 11	10 52	37 6	11 11	35 8	1 49	14 7	2 12	14 0
F.	17	6 13	10 41	18 0	11 4	17 1	11 31	33 10	11 55	32 2	2 36	13 6	3 2	13 0
S.	18	7 4	11 32	16 3	—	—	—	—	0 26	30 8	3 33	12 6	4 11	12 0
S.	19	7 54	0 7	15 8	0 44	15 6	1 4	29 6	1 47	29 3	4 53	11 9	5 36	11 9
M.	20	8 43	1 34	15 6	2 17	15 10	2 34	29 4	3 19	30 0	6 18	11 10	6 58	12 0
Tu.	21	9 31	3 0	16 4	3 37	16 11	4 2	31 1	4 43	32 3	7 34	12 4	8 6	12 8
W.	22	10 16	4 8	17 9	4 35	18 5	5 12	33 7	5 38	34 11	8 32	13 1	8 53	13 7
Th.	23	11 c	4 58	19 2	5 19	19 10	6 1	36 2	6 22	37 3	9 11	14 0	9 28	14 4
F.	24	11 42	5 38	20 4	5 56	20 10	6 40	38 3	6 56	39 2	9 44	14 8	9 59	15 0
S.	25	m.	6 12	21 4	6 27	21 8	7 12	40 0	7 27	40 9	10 14	15 4	10 28	15 6
S.	26	0 24	6 42	22 0	6 57	22 3	7 42	41 4	7 57	41 9	10 41	15 9	10 54	15 10
M.	27	1 6	7 12	22 5	7 27	22 6	8 12	41 11	8 27	41 10	11 8	15 11	11 22	16 0
Tu.	28	1 49	7 42	22 5	7 57	22 3	8 42	41 9	8 56	41 6	11 37	15 11	11 53	15 6

Half mean spring range.	PEMBROKE 11ft. 3in.	PORTISHEAD 21ft. 0in.	HOLYHEAD 8ft. 0in.

Phases of the moon.

	D.	H.	M.	
Last Quarter -	3	5	24	Afternoon.
New - - -	10	9	32	Morning.
First Quarter -	17	8	52	Morning.
Full - - -	25	2	16	Afternoon.
In Perigee -	9	2		Afternoon.
In Apogee -	22	2		Morning.

Moon's declination at noon.

M.D.	°	′	M.D.	°	′	M.D.	°	′	M.D.	°	′
1	10 S.59		9	15 S.49		17	23 N.14		25	5 N.25	
2	15	32	10	10	23	18	24	27	26	0	23
3	19	28	11	4	23	19	24	29	27	4 S.43	
4	22	30	12	1 N.44		20	23	24	28	9	42
5	24	18	13	7	36	21	21	18			
6	24	36	14	12	54	22	18	17			
7	23	14	15	17	22	23	14	32			
8	20	14	16	20	51	24	10	11			

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for PEMBROKE *add* 20 m. | PORTISHEAD *add* 11 m. | HOLYHEAD *add* 18 m.

FEBRUARY, 1899.

WEEK DAY	MONTH DAY	KINGSTOWN (Watering pier). APPROXIMATE { RISE 6 15 / FALL 6 0 } Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	BELFAST (New dock). APPROXIMATE { RISE 6 20 / FALL 6 0 } Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	LONDONDERRY (Ship bridge). APPROXIMATE { RISE 6 15 / FALL 6 15 } Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	☽'S AGE AT NOON. D.
W.	1	2 0	10 3	2 17	10 1	1 36	9 1	1 56	9 0	10 56	6 9	11 16	6 7	20·6
Th.	2	2 36	9 11	2 56	9 9	2 17	8 11	2 38	8 9	11 38	6 5	—	—	21·6
F.	3	3 17	9 7	3 40	9 5	3 0	8 7	3 23	8 6	0 4	6 2	0 34	5 11	☾
S.	4	4 7	9 3	4 39	9 0	3 50	8 4	4 21	8 3	1 8	5 8	1 47	5 7	23·6
S.	5	5 16	8 10	5 55	8 9	4 57	8 2	5 37	8 1	2 30	5 6	3 13	5 8	24·6
M.	6	6 36	8 10	7 18	9 1	6 19	8 0	7 3	8 1	3 55	5 10	4 34	6 1	25·6
Tu.	7	7 59	9 4	8 37	9 8	7 45	8 3	8 22	8 5	5 8	6 4	5 37	6 8	26·6
W.	8	9 11	10 0	9 42	10 4	8 53	8 9	9 21	9 1	6 5	6 11	6 32	7 3	27·6
Th.	9	10 10	10 8	10 34	11 0	9 47	9 10	10 12	9 6	6 58	7 7	7 24	7 10	28·6
F.	10	10 56	11 3	11 18	11 6	10 35	9 9	10 57	9 10	7 48	8 1	8 11	8 3	●
S.	11	11 40	11 8	—	—	11 19	9 11	11 40	10 0	8 32	8 5	8 52	8 6	1·1
S.	12	0 2	11 9	0 24	11 8	—	—	0 1	9 11	9 12	8 5	9 31	8 4	2·1
M.	13	0 45	11 7	1 6	11 5	0 22	9 11	0 43	9 10	9 50	8 2	10 9	7 11	3·1
Tu.	14	1 27	11 3	1 47	11 0	1 4	9 9	1 24	9 7	10 27	7 8	10 46	7 5	4·1
W.	15	2 7	10 8	2 27	10 4	1 44	9 5	2 6	9 3	11 6	7 1	11 30	6 8	5·1
Th.	16	2 48	10 0	3 11	9 9	2 29	9 0	2 53	8 9	11 57	6 4	—	—	6·1
F.	17	3 35	9 5	4 2	9 1	3 18	8 6	3 44	8 3	0 28	5 11	1 2	5 7	☽
S.	18	4 32	8 9	5 8	8 6	4 14	8 1	4 49	7 11	1 39	5 4	2 21	5 2	8·1
S.	19	5 47	8 4	6 27	8 4	5 28	7 9	6 9	7 9	3 3	5 2	3 44	5 3	9·1
M.	20	7 7	8 5	7 45	8 7	6 51	7 8	7 31	7 9	4 23	5 5	4 58	5 7	10·1
Tu.	21	8 22	8 9	8 56	8 11	8 8	7 10	8 40	8 0	5 28	5 9	5 55	5 11	11·1
W.	22	9 25	9 2	9 49	9 5	9 6	8 3	9 27	8 6	6 17	6 2	6 37	6 5	12·1
Th.	23	10 10	9 8	10 27	9 11	9 46	8 10	10 4	8 10	6 56	6 7	7 14	6 10	13·1
F.	24	10 42	10 2	10 56	10 4	10 20	9 0	10 35	9 2	7 31	7 0	7 48	7 2	14·1
S.	25	11 10	10 6	11 24	10 8	10 50	9 3	11 4	9 4	8 4	7 4	8 18	7 6	○
S.	26	11 38	10 10	11 53	10 10	11 18	9 4	11 32	9 5	8 32	7 7	8 46	7 8	16·1
M.	27	—	—	0 9	10 11	11 46	9 5	mid.	9 5	8 59	7 9	9 13	7 8	17·1
Tu.	28	0 25	10 11	0 41	10 10	—	—	0 16	9 5	9 27	7 7	9 41	7 6	18·1

Half mean spring range.	KINGSTOWN 5ft. 6in.	BELFAST 4ft. 9in.	LONDONDERRY 3ft. 10in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D	M. S.	
1	13 48	Sub.	9	14 26	Sub.	17	14 13	Sub.	25	13 15	Sub.
2	13 56		10	14 27		18	14 8		26	13 5	
3	14 3		11	14 27		19	14 3		27	12 54	
4	14 8		12	14 27		20	13 56		28	12 43	
5	14 13		13	14 26		21	13 49				
6	14 18		14	14 24		22	13 42				
7	14 21		15	14 21		23	13 33				
8	14 24		16	14 17		24	13 25				

The times of high water are given for Mean time at place ; if Dublin or Railway time be required,—for KINGSTOWN *subtract* 1 m. for Dublin time. | BELFAST *subtract* 2 m. | LONDONDERRY *add* 4 m.

FEBRUARY, 1899.

Week Day	Month Day	Moon's Transit H.M.	Sligo Bay (Mulloghmore) Approximate Rise 6 10 / Fall 6 20 Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	Galway (Nimmo pier) Approximate Rise 6 30 / Fall 6 0 Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	Queenstown (Scott's wharf) Approximate Rise 6 5 / Fall 6 25 Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.
W.	1	3m50	8 19	9 10	8 38	9 7	7 43	13 5	8 2	13 1	8 4	10 10	8 21	10 8
Th.	2	+ 35	8 58	9 4	9 20	9 1	8 21	12 9	8 41	12 3	8 38	10 5	8 56	10 2
F.	3	5 24	9 46	8 10	10 15	8 7	9 4	11 10	9 29	11 4	9 16	9 11	9 39	9 7
S.	4	6 17	10 50	8 5	11 29	8 4	10 0	11	10 37	10 10	10 5	9 4	10 37	9 2
S.	5	7 14	—		0 10	8 3	11 19	10 9	—		11 17	9	—	
M.	6	8 15	0 53	8 4	1 36	8 6	0 4	10 9	0 48	11 1	0 1	9 1	0 47	9 3
Tu.	7	9 18	2 17	8 10	2 53	9 3	1 29	11 7	2 5	12 3	1 32	9 6	2 13	9 11
W.	8	10 20	3 23	9 9	3 49	10 3	2 35	12 10	3 5	13 6	2 51	10 4	3 24	10 10
Th.	9	11 19	4 14	10 9	4 38	11 3	3 33	14 3	3 58	14 9	3 53	11 4	4 20	11 9
F.	10	0a16	5 2	11	5 25	11 11	4 21	15 4	4 44	15 9	4 44	12 1	5 8	12 5
S.	11	1 9	5 47	12	6 8	12 3	5 6	16 2	5 28	16 4	5 32	12 8	5 55	12 9
S.	12	2 1	6 29	12 2	6 50	12 0	5 50	16 4	6 11	16 2	6 17	12 10	6 38	12 9
M.	13	2 51	7 11	11	7 31	11 6	6 32	15 11	6 53	15 7	6 58	12 7	7 18	12 4
Tu.	14	3 41	7 50	11 1	8 9	10 8	7 13	15 2	7 32	14 8	7 37	12 0	7 56	11 8
W.	15	4 31	8 28	10 3	8 49	9 9	7 52	14 4	8 13	13 4	8 14	11 1	8 32	10 10
Th.	16	5 22	9 13	9 3	9 40	8 10	8 36	12 7	9 0	11 10	8 51	10 4	9 11	9 11
F.	17	6 13	10 6	8 2	10 43	8 2	9 25	11 2	9 54	10 7	9 33	9 6	9 58	9 1
S.	18	7 4	11 20	7 10	mid.	7	10 28	10 1	11 8	9 10	10 29	8 9	11 8	8 5
S.	19	7 54	—		0 42	7 7	11 51	9 9	—		11 50	8 4	—	
M.	20	8 43	1 24	7 8	2 4	7 10	0 35	9 10	1 15	10 1	0 35	8 5	1 17	8 6
Tu.	21	9 31	2 41	8 1	3 13	8 4	1 52	10 5	2 24	10 10	1 58	8 9	2 35	9 0
W.	22	10 16	3 38	8 9	3 56	9 1	2 49	11 4	3 11	11 9	3 4	9 4	3 28	9 8
Th.	23	11 0	4 13	9 6	4 30	9 10	3 31	12 3	3 49	12 8	3 50	10 0	4 10	10 4
F.	24	11 42	4 46	10 2	5 2	10 5	4 6	13 1	4 22	13 6	4 28	10 8	4 44	10 11
S.	25	m.	5 17	10 8	5 32	10 11	4 37	13 10	4 51	14 2	5 0	11 2	5 16	11 4
S.	26	0 24	5 47	11 1	6 2	11 2	5 5	14 6	5 20	14 8	5 32	11 6	5 48	11 8
M.	27	1 6	6 17	11 3	6 32	11 2	5 35	14 9	5 50	14 10	6 4	11 8	6 19	11 9
Tu.	28	1 49	6 47	11 1	7 2	10 11	6 6	14 9	6 22	14 8	6 34	11 9	6 49	11 8

Half mean spring range	Sligo: 5ft. 7in.	Galway: 7ft. 5in.	Queenstown: 5ft. 10in.

Phases of the moon.

	D.	H.	M.	
Last Quarter -	3	5	24	Afternoon.
New - - -	10	9	32	Morning.
First Quarter -	17	8	52	Morning.
Full - - -	25	2	16	Afternoon.
In Perigee -	9	2		Afternoon.
In Apogee -	22	2		Morning.

Moon's declination at noon.

M.D.	° '	M.D.	° '	M.D.	° '	M.D.	° '
1	10 S.59	9	15 S.49	17	23 N.14	25	5 N.25
2	15 32	10	10 23	18	24 27	26	0 23
3	19 28	11	4 23	19	24 29	27	4 S.43
4	22 30	12	1 N.44	20	23 24	28	9 42
5	24 18	13	7 36	21	21 18		
6	24 36	14	12 54	22	18 17		
7	23 14	15	17 22	23	14 32		
8	20 14	16	20 51	24	10 11		

The times of high water are given for Mean time at place; if Dublin or Railway time be required,—for SLIGO BAY add 9 m. | GALWAY add 11 m. | QUEENSTOWN add 8 m.

FEBRUARY, 1899.

WEEK DAY.	MONTH DAY.	WATERFORD (Duncannon fort). APPROXIMATE RISE 6 5, FALL 6 20												☾'S AGE AT NOON.
		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.		
		Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	D.
W.	1	8 24	11 10	8 40	11 8									20·6
Th.	2	8 56	11 5	9 13	11 2									21·6
F.	3	9 32	10 11	9 54	10 8									☾
S.	4	10 23	10 4	10 59	10 0									23·6
S.	5	11 37	9 10	—	—									24·6
M.	6	0 17	9 9	0 59	10 0									25·6
Tu.	7	1 42	10 3	2 24	10 8									26·6
W.	8	3 3	11 2	3 39	11 8									27·6
Th.	9	4 11	12 1	4 40	12 6									28·6
F.	10	5 7	12 10	5 31	13 1									●
S.	11	5 53	13 3	6 15	13 5									1·1
S.	12	6 37	13 6	6 59	13 5									2·1
M.	13	7 20	13 3	7 40	13 1									3·1
Tu.	14	7 58	12 10	8 15	12 7									4·1
W.	15	8 33	12 3	8 51	11 10									5·1
Th.	16	9 9	11 5	9 27	10 11									6·1
F.	17	9 47	10 6	10 15	10 0									☽
S.	18	10 51	9 7	11 29	9 3									8·1
S.	19	—	—	0 8	9 1									9·1
M.	20	0 48	9 2	1 27	9 3									10·1
Tu.	21	2 6	9 6	2 43	9 9									11·1
W.	22	3 15	10 2	3 43	10 6									12·1
Th.	23	4 8	10 10	4 29	11 1									13·1
F.	24	4 48	11 5	5 6	11 8									14·1
S.	25	5 23	11 10	5 38	12 0									○
S.	26	5 53	12 2	6 8	12 3									16·1
M.	27	6 23	12 4	6 39	12 5									17·1
Tu.	28	6 55	12 5	7 11	12 5									18·1

Half mean spring range } 6ft. 2in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	13 48	Sub.	9	14 26	Sub.	17	14 13	Sub.	25	13 15	Sub.
2	13 56		10	14 27		18	14 8		26	13 5	
3	14 3		11	14 27		19	14 3		27	12 54	
4	14 8		12	14 27		20	13 56		28	12 43	
5	14 13		13	14 26		21	13 49				
6	14 18		14	14 24		22	13 42				
7	14 21		15	14 21		23	13 33				
8	14 24		16	14 17		24	13 25				

The times of high water are given for Mean time at place ; if Dublin or Railway time be required,—for WATERFORD add 3 m.

MARCH, 1899.

WEEK DAY.	MONTH DAY.	MOON'S TRANSIT.	BREST (Entr. of Dockyard basin). APPROXIMATE - {RISE 6 10, FALL 6 20}				High Water.		DEVONPORT (H.M. Dockyard). APPROXIMATE - {RISE 6 0, FALL 6 10}				Low Water.			
			MORNING.		AFTERNOON.		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.			
			Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.		
W.	1	2m34	5 45 18	8	6 1 18	5	7 42 15	1	7 57 14	9	1 44	0	9	1 58	0	8
Th.	2	3 21	6 18 18	1	6 36 17	7	8 13 14	7	8 30 14	9	2 13	1	1	2 29	1	3
F.	3	4 13	6 56 17	0	7 18 16	3	8 47 14	1	9 5 13	10	2 45	1	8	3 1	2	0
S.	4	5 7	7 42 15	7	8 8 14	11	9 25 13	5	9 46 13	4	3 18	2	4	3 37	2	11
S.	5	6 5	8 37 14	3	9 12 13	9	10 11 12	8	10 40 12	10	3 57	3	1	4 20	3	10
M.	6	7 5	9 55 13	7	10 44 13	8	11 15 12	1	11 57 12	6	4 50	3	10	5 30	4	8
Tu.	7	8 5	11 34 14	0	—		—		0 46 11	11	6 15	4	3	7 2	4	9
W.	8	9 3	0 21 14	7	1 1 15	5	1 36 13	1	2 23 12	8	7 50	3	6	8 38	3	8
Th.	9	10 0	1 33 16	5	2 0 17	5	3 4 14	1	3 40 13	10	9 21	2	1	9 57	2	3
F.	10	10 54	2 25 18	4	2 48 19	3	4 10 15	3	4 38 14	10	10 26	0	9	10 53	1	1
S.	11	11 46	3 10 20	0	3 31 20	6	5 4 16	1	5 29 15	8	11 18	*0	5	11 43	0	0
S.	12	0a37	3 52 20	9	4 13 20	11	5 51 16	7	6 13 16	1	—		—	0	7	*1	1
M.	13	1 28	4 34 20	10	4 54 20	8	6 35 16	9	6 56 16	3	0 29	*0	9	0 50	*1	4
Tu.	14	2 19	5 13 20	5	5 31 19	11	7 14 16	5	7 32 15	11	1 10	*0	9	1 29	*0	10
W.	15	3 11	5 49 19	4	6 8 18	3	7 49 15	9	8 6 15	4	1 47	*0	4	2 5	*0	1
Th.	16	4 3	6 27 17	11	6 47 17	1	8 22 14	11	8 38 14	6	2 22	0	6	2 37	1	0
F.	17	4 56	7 7 16	2	7 28 15	3	8 54 13	10	9 11 13	8	2 53	1	6	3 9	2	3
S.	18	5 47	7 51 14	5	8 17 13	6	9 29 12	9	9 50 12	8	3 25	2	8	3 41	3	8
S.	19	6 37	8 46 12	11	9 21 12	5	10 14 11	8	10 43 11	10	3 59	3	10	4 23	5	0
M.	20	7 25	10 4 12	3	10 50 12	3	11 16 10	10	11 56 11	7	4 56	4	11	5 33	5	11
Tu.	21	8 12	11 36 12	5	—		—		0 40 10	10	6 13	5	3	6 56	5	11
W.	22	8 56	0 18 12	10	0 54 13	5	1 24 11	11	2 4 11	5	7 38	4	7	8 18	4	11
Th.	23	9 38	1 23 14	2	1 47 14	10	2 41 12	10	3 14 12	5	8 57	3	6	9 32	3	9
F.	24	10 21	2 6 15	7	2 23 16	4	3 41 13	8	4 5 13	3	9 59	2	5	10 21	2	10
S.	25	11 3	2 39 17	0	2 55 17	7	4 26 14	4	4 46 14	0	10 41	1	7	11 0	1	9
S.	26	11 46	3 11 18	2	3 27 18	6	5 5 14	11	5 23 14	9	11 19	0	9	11 37	0	11
M.	27	m.	3 43 18	10	3 59 19	0	5 40 15	5	5 56 15	3	11 55	0	3	—		
Tu.	28	0 31	4 15 19	2	4 31 19	3	6 13 15	7	6 30 15	4	0 12	0	3	0 28	*0	2
W.	29	1 18	4 47 19	3	5 4 19	1	6 47 15	6	7 3 15	5	0 44	0	1	1 0	0	1
Th.	30	2 9	5 22 18	11	5 40 18	7	7 18 15	3	7 34 15	1	1 16	0	3	1 33	0	4
F.	31	3 3	5 59 18	3	6 19 17	9	7 52 14	10	8 10 14	9	1 50	0	8	2 8	0	11

Half mean spring range.	9ft. 6in.		7ft. 9in.	

Phases of the moon.			Moon's declination at noon.								

Phases of the moon.

	D.	H.	M.	
Last Quarter	5	4	7	Morning.
New	11	7	53	Afternoon.
First Quarter	19	3	24	Morning.
Full	27	6	18	Morning.
In Perigee	9	10		Afternoon.
In Apogee	21	7		Afternoon.

Moon's declination at noon.

M.D.	o	'	M.D.	o	'	M.D.	o	'	M.D.	o	'
1	14 S.	21	9	12 S.	45	17	23 N.	55	25	1 N.	51
2	18	25	10	7	6	18	24	21	26	3 S.	15
3	21	38	11	1	4	19	23	36	27	8	18
4	23	44	12	4 N.	56	20	21	48	28	13	5
5	24	28	13	10	33	21	19	4	29	17	20
6	23	41	14	15	42	22	15	34	30	20	47
7	21	21	15	19	26	23	11	25	31	23	8
8	17	37	16	23	17	24	6	48			

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for BREST *add* 18 m. DEVONPORT *add* 17 m.
* Below zero, or datum to which soundings on charts are reduced.

MARCH, 1899.

PORTSMOUTH (*H.M. Dockyard*). APPROXIMATE - { RISE 7 20 / FALL 5 10 }

DOVER (*North pier*). APPROXIMATE - { RISE 5 0 / FALL 7 30 }

Week Day	Month Day	High Water Morning Time H.M.	Height F.I.	High Water Afternoon Time H.M.	Height F.I.	Low Water Morning Time H.M.	Height F.I.	Low Water Afternoon Time H.M.	Height F.I.	Dover Morning Time H.M.	Height F.I.	Dover Afternoon Time H.M.	Height F.I.	☾'s AGE AT NOON. D.
W.	1	1 32	13 3	1 48	13 2	6 29	0 2	6 44	0 4	1 7	18 7	1 24	18 5	19·1
Th.	2	2 4	13 1	2 20	12 11	7 0	0 7	7 16	0 11	1 42	18 3	2 0	18 0	20·1
F.	3	2 37	12 8	2 56	12 5	7 33	1 3	7 52	1 8	2 18	17 8	2 38	17 3	21·1
S.	4	3 18	12 1	3 41	11 9	8 14	2 1	8 40	2 6	3 0	16 9	3 23	16 3	22·1
S.	5	4 6	11 5	4 33	11 1	9 10	3 0	9 45	3 5	3 47	15 9	4 13	15 2	☾
M.	6	5 7	10 9	5 48	10 7	10 29	3 9	11 14	3 10	4 45	14 8	5 23	14 4	24·1
Tu.	7	6 34	10 6	7 23	10 9	—	—	0 6	3 9	6 5	14 3	6 51	14 7	25·1
W.	8	8 10	11 2	8 51	11 3	0 58	3 5	1 39	2 10	7 36	15 3	8 16	15 11	26·1
Th.	9	9 25	12 1	9 54	12 8	2 11	2 2	2 39	1 6	8 50	16 8	9 18	17 6	27·1
F.	10	10 20	13 2	10 43	13 7	3 4	0 10	3 27	0 4	9 43	18 2	10 8	18 9	28·1
S.	11	11 6	13 11	11 28	14 2	3 50	*0 1	4 12	*0 5	10 33	19 3	10 57	19 8	●
S.	12	11 49	14 4	—	—	4 33	*0 8	4 53	*0 10	11 20	19 11	11 43	20 1	0·7
M.	13	0 10	14 5	0 31	14 6	5 13	*1 0	5 33	*0 11	—	—	0 5	20 1	1·7
Tu.	14	0 52	14 4	1 12	14 1	5 52	*0 10	6 11	*0 8	0 27	20 0	0 48	19 9	2·7
W.	15	1 31	13 10	1 50	13 6	6 30	*0 4	6 48	0 0	1 8	19 5	1 28	19 0	3·7
Th.	16	2 9	13 2	2 28	12 10	7 6	0 6	7 24	1 0	1 48	18 6	2 8	18 0	4·7
F.	17	2 48	12 5	3 8	12 0	7 43	1 7	8 4	2 1	2 28	17 4	2 48	16 8	5·7
S.	18	3 29	11 7	3 50	11 2	8 27	2 8	8 53	3 3	3 9	16 0	3 30	15 4	6·7
S.	19	4 14	10 9	4 42	10 4	9 24	3 10	9 59	4 3	3 55	14 8	4 22	14 0	☽
M.	20	5 16	10 1	5 57	9 10	10 39	4 5	11 26	4 6	4 53	13 6	5 29	13 3	8·7
Tu.	21	6 40	9 9	7 24	9 11	—	—	0 14	4 5	6 10	13 2	6 52	13 5	9·7
W.	22	8 5	10 3	8 42	10 7	1 0	4 2	1 36	3 9	7 32	13 10	8 8	14 4	10·7
Th.	23	9 13	10 11	9 38	11 4	2 6	3 3	2 32	2 9	8 38	14 11	9 2	15 6	11·7
F.	24	10 0	11 6	10 18	12 1	2 52	2 3	3 10	1 10	9 23	16 0	9 41	16 6	12·7
S.	25	10 35	12 5	10 51	12 8	3 26	1 5	3 42	1 1	9 59	17 0	10 17	17 6	13·7
S.	26	11 7	12 11	11 23	13 2	3 58	0 9	4 13	0 6	10 35	17 10	10 52	18 2	14·7
M.	27	11 39	13 4	11 55	13 5	4 28	0 4	4 43	0 2	11 9	18 5	11 27	18 7	O
Tu.	28	—	—	0 12	13 6	4 59	0 0	5 15	*0 1	11 45	18 8	—	—	16·7
W.	29	0 29	13 7	0 47	13 6	5 31	*0 1	5 47	0 0	0 3	18 9	0 21	18 10	17·7
Th.	30	1 5	13 5	1 23	13 4	6 4	0 1	6 21	0 2	0 39	18 9	0 58	18 8	18·7
F.	31	1 41	13 2	2 0	13 0	6 39	0 4	6 57	0 8	1 18	18 5	1 38	18 2	19·7

Half mean spring range. } 6ft. 9in. 9ft. 4in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	12 32	Sub.	9	10 42	Sub.	17	8 31	Sub.	25	6 6	Sub.
2	12 19		10	10 27		18	8 13		26	5 47	
3	12 7		11	10 11		19	7 55		27	5 29	
4	11 54		12	9 55		20	7 37		28	5 10	
5	11 40		13	9 39		21	7 19		29	+ 52	
6	11 26		14	9 22		22	7 1		30	4 34	
7	11 12		15	9 5		23	6 43		31	4 15	
8	10 57		16	8 48		24	6 24				

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for PORTSMOUTH *add* 4 m. } DOVER *subtract* 5 m.
* Below zero, or datum to which soundings on charts are reduced.

MARCH, 1899.

Week Day	Month Day	Moon's Transit	SHEERNESS (H.M. Dockyard) Morning Time H. M.	Height F. I.	Afternoon Time H. M.	Height F. I.	CHATHAM (H.M. Dockyard) High Water Morning Time H. M.	Height F. I.	Afternoon Time H. M.	Height F. I.	Low Water Morning Time H. M.	Height F. I.	Afternoon Time H. M.	Height F. I.
W.	1	2m34	2 47	16 0	3 1	15 11	2 5	17 11	3 6	17 10	9 13	0 5	9 26	0 6
Th.	2	3 21	3 15	15 10	3 31	15 8	3 21	17 8	3 38	17 6	9 39	0 8	9 53	0 10
F.	3	4 13	3 48	15 5	4 6	15 1	3 55	17 3	4 13	16 11	10 7	1 1	10 21	1 4
S.	4	5 7	4 26	14 9	4 49	14 5	4 31	16 6	4 52	16 1	10 37	1 7	10 56	1 11
S.	5	6 5	5 14	14 0	5 41	13 8	5 15	15 7	5 42	15 2	11 17	2 5	11 42	2 11
M.	6	7 5	6 12	13 4	6 51	13 0	6 14	14 9	6 54	14 6	—	—	0 14	3 5
Tu.	7	8 5	7 37	12 11	8 26	13 1	7 40	14 4	8 29	14 4	0 57	3 6	1 47	3 4
W.	8	9 3	9 15	13 5	10 0	13 10	9 20	14 8	10 7	15 4	2 41	2 11	3 34	2 6
Th.	9	10 0	10 37	14 4	11 7	14 11	10 46	16 0	11 17	16 8	4 20	2 0	4 58	1 6
F.	10	10 54	11 34	15 6	11 58	15 11	11 42	17 3	—	—	5 30	1 0	5 58	0 6
S.	11	11 46			0 21	16 4	0 5	17 10	0 27	18 5	6 23	0 1	6 47	*0 3
S.	12	0a37	0 43	16 9	1 4	17 0	0 49	18 11	1 11	19 3	7 10	*0 6	7 32	*0 9
M.	13	1 28	1 25	17 2	1 46	17 3	1 32	19 5	1 52	19 6	7 54	*1 0	8 15	*1 1
Tu.	14	2 19	2 6	17 2	2 25	17 1	2 11	19 5	2 30	19 3	8 35	*1 0	8 53	*0 11
W.	15	3 11	2 43	16 10	3 1	16 7	2 49	19 0	3 8	18 7	9 10	*0 7	9 26	*0 3
Th.	16	4 3	3 19	16 2	3 38	15 9	3 26	18 2	3 43	17 8	9 42	0 2	9 57	0 8
F.	17	4 56	3 57	15 4	4 17	14 10	4 4	17 2	4 23	16 8	10 12	1 1	10 28	1 6
S.	18	5 47	4 38	14 4	5 0	13 10	4 43	16 1	5 3	15 4	10 45	2 0	11 5	2 7
S.	19	6 37	5 24	13 4	5 51	12 10	5 26	14 9	5 53	14 2	11 27	3 3	11 54	3 11
M.	20	7 25	6 23	12 6	7 0	12 3	6 26	13 10	7 5	13 6	—	—	0 27	4 3
Tu.	21	8 12	7 45	12 2	8 32	12 3	7 49	13 5	8 35	13 4	1 9	4 4	1 58	4 2
W.	22	8 56	9 16	12 6	9 55	12 10	9 21	13 7	10 3	14 0	2 48	3 11	3 36	3 7
Th.	23	9 38	10 29	13 2	10 58	13 7	10 39	14 6	11 8	15 0	4 17	3 3	4 51	2 11
F.	24	10 21	11 21	14 0	11 40	14 0	11 30	15 6	11 48	16 0	5 19	2 6	5 43	2 1
S.	25	11 3	11 56	14 9					0 3	16 5	6 4	1 9	6 22	1 5
S.	26	11 46	0 12	15 5	0 28	15 5	0 18	16 10	0 34	17 3	6 39	1 2	6 56	1 0
M.	27	m.	0 44	15 8	1 0	15 10	0 50	17 7	1 6	17 10	7 13	0 9	7 29	0 7
Tu.	28	0 31	1 16	16 0	1 32	16 2	1 22	18 0	1 38	18 2	7 45	0 5	8 1	0 3
W.	29	1 18	1 48	16 3	2 4	16 3	1 54	18 4	2 10	18 4	8 17	0 2	8 33	0 2
Th.	30	2 9	2 20	16 2	2 36	16 1	2 26	18 2	2 42	18 0	8 48	0 3	9 3	0 4
F.	31	3 3	2 53	16 0	3 10	15 9	2 58	17 10	3 16	17 7	9 18	0 6	9 33	0 9

SHEERNESS APPROXIMATE - { Rise 6 5, Fall 6 25 }
CHATHAM APPROXIMATE - { Rise 6 35, Fall 6 5 }

Half mean spring range } 8ft. 0in.   9ft. 1in.

Phases of the moon.

	D.	H.	M.	
Last Quarter -	5	4	7	Morning.
New - - - -	11	7	53	Afternoon.
First Quarter -	19	3	24	Morning.
Full - - - -	27	6	18	Morning.
In Perigee - -	9	10		Afternoon.
In Apogee -	21	7		Afternoon.

Moon's declination at noon.

M.D.	o '	M.D.	o '	M.D.	o '	M.D.	o '
1	14 S.21	9	12 S.45	17	23 N.55	25	1 N.51
2	18 25	10	7 6	18	24 21	26	3 S.15
3	21 38	11	1 4	19	23 36	27	8 18
4	23 44	12	4 N.56	20	21 48	28	13 5
5	24 28	13	10 33	21	19 4	29	17 20
6	23 41	14	15 28	22	15 34	30	20 47
7	21 21	15	19 26	23	11 25	31	23 8
8	17 37	16	23 17	24	6 48		

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for SHEERNESS *subtract* 3 m. | CHATHAM *subtract* 2 m.
* Below zero, or datum to which soundings on charts are reduced.

MARCH, 1899.

Approximate — LONDON (London bridge): Rise 5h 30m, Fall 7h 0m
Approximate — HARWICH (Angel quay): Rise 6h 25m, Fall 6h 0m
Approximate — HULL (Victoria dock): Rise 5h 40m, Fall 6h 30m

Week Day	Month Day	London Morning Time H.M.	London Morning Height F.I.	London Afternoon Time H.M.	London Afternoon Height F.I.	Harwich Morning Time H.M.	Harwich Morning Height F.I.	Harwich Afternoon Time H.M.	Harwich Afternoon Height F.I.	Hull Morning Time H.M.	Hull Morning Height F.I.	Hull Afternoon Time H.M.	Hull Afternoon Height F.I.	C's Age at Noon D.
W.	1	4 6	20 8	4 21	20 7	2 0	11 5	2 16	11 4	8 34	20 9	8 50	20 6	19·1
Th.	2	4 36	20 6	4 52	20 3	2 32	11 3	2 49	11 2	9 7	20 3	9 25	19 10	20·1
F.	3	5 9	20 0	5 27	19 8	3 7	11 0	3 25	10 10	9 43	19 5	10 2	18 11	21·1
S.	4	5 46	19 3	6 8	18 9	3 44	10 8	4 5	10 5	10 24	18 4	10 49	17 9	22·1
S.	5	6 32	18 3	7 0	17 9	4 28	10 2	4 53	10 0	11 19	17 3	11 55	16 9	☽
M.	6	7 30	17 5	8 6	17 1	5 23	9 10	5 58	9 8	—	—	0 36	16 4	24·1
Tu.	7	8 49	17 2	9 39	17 3	6 43	9 8	7 34	9 9	1 18	16 2	2 1	16 3	25·1
W.	8	10 30	17 6	11 14	17 11	8 23	9 11	9 7	10 2	2 45	16 8	3 27	17 5	26·1
Th.	9	11 52	18 6	—	—	9 44	10 6	10 16	10 10	4 4	18 3	4 36	19 1	27·1
F.	10	0 25	19 3	0 52	19 11	10 45	11 2	11 10	11 6	5 3	19 11	5 26	20 7	28·1
S.	11	1 17	20 6	1 40	20 11	11 33	11 9	11 56	12 0	5 49	21 2	6 12	21 8	●
S.	12	2 2	21 3	2 24	21 7	—	—	0 17	12 2	6 34	22 0	6 56	22 3	0·7
M.	13	2 45	21 10	3 5	22 0	0 38	12 3	0 58	12 3	7 17	22 5	7 37	22 5	1·7
Tu.	14	3 25	21 11	3 44	21 9	1 18	12 2	1 38	12 1	7 57	22 3	8 16	22 0	2·7
W.	15	4 3	21 6	4 22	21 3	1 58	11 11	2 17	11 8	8 35	21 7	8 54	21 1	3·7
Th.	16	4 41	20 11	5 0	20 6	2 36	11 5	2 55	11 2	9 13	20 5	9 33	19 9	4·7
F.	17	5 19	20 0	5 39	19 5	3 15	10 11	3 35	10 8	9 53	19 0	10 13	18 3	5·7
S.	18	5 59	18 9	6 19	18 1	3 55	10 5	4 15	10 1	10 35	17 6	11 1	16 10	6·7
S.	19	6 42	17 6	7 8	16 11	4 37	9 10	5 3	9 7	11 32	16 1	—	—	☾
M.	20	7 39	16 6	8 14	16 3	5 33	9 4	6 9	9 3	0 8	15 6	0 47	15 2	8·7
Tu.	21	8 56	16 3	9 44	16 4	6 53	9 2	7 39	9 3	1 27	14 11	2 7	15 0	9·7
W.	22	10 30	16 6	11 9	16 10	8 23	9 2	9 9	9 7	2 46	15 4	3 23	15 11	10·7
Th.	23	11 45	17 2	—	—	9 37	9 10	10 6	10 1	3 57	16 6	4 26	17 2	11·7
F.	24	0 14	17 9	0 37	18 3	10 30	10 4	10 50	10 7	4 50	17 10	5 9	18 4	12·7
S.	25	0 58	18 9	1 16	19 2	11 7	10 10	11 24	11 1	5 26	18 10	5 42	19 4	13·7
S.	26	1 32	19 6	1 48	19 9	11 41	11 3	11 57	11 5	5 57	19 9	6 13	20 1	14·7
M.	27	2 4	20 0	2 20	20 3	—	—	0 13	11 6	6 29	20 5	6 45	20 8	O
Tu.	28	2 36	20 8	2 51	20 8	0 29	11 7	0 44	11 8	7 2	20 10	7 19	20 11	16·7
W.	29	3 6	20 9	3 22	20 10	1 0	11 7	1 17	11 7	7 36	21 0	7 53	21 0	17·7
Th.	30	3 38	20 9	3 55	20 8	1 34	11 6	1 51	11 5	8 10	20 11	8 27	20 9	18·7
F.	31	4 12	20 7	4 30	20 5	2 9	11 4	2 27	11 3	8 45	20 5	9 4	20 1	19·7

Half mean spring range: LONDON 10ft. 4in. — HARWICH 5ft. 9in. — HULL 10ft. 5in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	12 32	Sub.	9	10 42	Sub.	17	8 31	Sub.	25	6 6	Sub.
2	12 19		10	10 27		18	8 13		26	5 47	
3	12 7		11	10 11		19	7 55		27	5 29	
4	11 54		12	9 55		20	7 37		28	5 10	
5	11 40		13	9 39		21	7 19		29	4 52	
6	11 26		14	9 22		22	7 1		30	4 34	
7	11 12		15	9 5		23	6 43		31	4 15	
8	10 57		16	8 48		24	6 24				

MARCH, 1899.

Week Day	Month Day	Moon's Transit H. M.	Sunderland (North dock) Morning Time H.M. / Height F.I.	Sunderland Afternoon Time H.M. / Height F.I.	North Shields (Low lighthouse) Morning Time / Height	North Shields Afternoon Time / Height	Leith (East pier) Morning Time / Height	Leith Afternoon Time / Height
			Rise 6 5 / Fall 6 25		Rise 5 40 / Fall 6 43		Rise 6 0 / Fall 6 15	
W.	1	2m34	5 25 14 2	5 40 14 0	5 28 14 3	5 44 14 1	+ 23 15 11	+ 39 15 9
Th.	2	3 21	5 57 13 9	6 15 13 6	6 0 13 11	6 18 13 8	+ 56 15 7	5 14 15 9
F.	3	4 13	6 34 13 2	6 55 12 10	6 37 13 5	6 58 13 11	5 33 15 0	5 54 14 8
S.	4	5 7	7 18 12 5	7 44 12 0	7 21 12 8	7 47 12 3	6 17 14 2	6 43 13 8
S.	5	6 5	8 12 11 8	8 44 11 4	8 17 11 10	8 52 11 5	7 12 13 3	7 46 12 11
M.	6	7 5	9 22 11 0	10 7 10 10	9 32 11 2	10 18 11 1	8 26 12 7	9 12 12 5
Tu.	7	8 5	10 53 10 11	11 40 11 2	11 5 11 3	11 52 11 7	10 0 12 6	10 46 12 9
W.	8	9 3	—	0 20 11 8	—	0 34 12 0	11 27 13 3	—
Th.	9	10 0	0 56 12 3	1 26 12 11	1 8 12 6	1 37 13 0	0 3 13 10	0 31 14 6
F.	10	10 54½	1 54 13 6	2 20 14 0	2 23 13 7	2 25 14 2	0 56 15 2	1 20 15 11
S.	11	11 46	2 45 14 6	3 8 14 10	2 47 14 8	3 8 15 1	1 43 16 6	2 5 17 0
S.	12	0a37	3 28 15 2	3 48 15 5	3 29 15 5	3 49 15 8	2 26 17 4	2 46 17 7
M.	13	1 28	4 8 15 7	4 28 15 8	4 9 15 9	4 29 15 10	3 6 17 8	3 26 17 7
Tu.	14	2 19	4 47 15 6	5 6 15 3	4 49 15 7	5 9 15 4	3 45 17 5	4 4 17 1
W.	15	3 11	5 25 14 10	5 44 14 5	5 29 14 11	5 48 14 6	4 23 16 8	4 42 16 3
Th.	16	4 3	6 4 13 11	6 24 13 6	6 8 14 1	6 28 13 8	5 2 15 9	5 22 15 3
F.	17	4 56	6 46 12 11	7 8 12 4	6 49 13 2	7 10 12 8	5 44 14 9	6 7 14 1
S.	18	5 47	7 31 11 10	7 55 11 4	7 33 12 1	7 59 11 6	6 31 13 6	6 56 12 11
S.	19	6 37	8 23 10 10	8 55 10 5	8 29 10 11	9 4 10 7	7 24 12 4	7 58 11 11
M.	20	7 25	9 33 10 1	10 16 9 11	9 43 10 4	10 26 10 3	8 37 11 7	9 21 11 5
Tu.	21	8 12	10 59 9 11	11 40 10 2	11 11 10 4	11 53 10 6	10 5 11 6	10 46 11 8
W.	22	8 56	—	0 16 10 6	—	0 30 10 10	11 23 12 0	11 55 12 5
Th.	23	9 38	0 49 10 11	1 17 11 5	1 2 11 2	1 28 11 7	—	0 22 12 10
F.	24	10 21	1 40 11 10	2 1 12 3	1 50 12 0	2 8 12 5	0 44 13 4	1 2 13 10
S.	25	11 3	2 19 12 8	2 36 13 1	2 24 12 10	2 40 13 3	1 19 14 4	1 35 14 10
S.	26	11 46	2 53 13 5	3 9 13 8	2 55 13 7	3 10 13 11	1 51 15 3	2 7 15 8
M.	27	m.	3 24 13 11	3 39 14 2	3 24 14 2	3 39 14 5	2 23 15 11	2 38 16 2
Tu.	28	0 31	3 54 14 4	4 10 14 5	3 55 14 6	4 11 14 7	2 53 16 4	3 8 16 5
W.	29	1 18	4 26 14 6	4 42 14 6	4 27 14 8	4 44 14 7	3 24 16 5	3 40 16 4
Th.	30	2 9	4 59 14 5	5 17 14 3	5 2 14 5	5 20 14 3	3 56 16 2	4 14 16 0
F.	31	3 3	5 35 14 0	5 55 13 8	5 38 14 0	5 58 13 9	4 33 15 9	4 53 15 6

Half mean spring range: Sunderland 7ft. 2in. — North Shields 7ft. 4in. — Leith 8ft. 2in.

Phases of the moon.

	D.	H.	M.	
Last Quarter -	5	4	7	Morning.
New - - -	11	7	53	Afternoon.
First Quarter -	19	3	24	Morning.
Full - - -	27	6	18	Morning.
In Perigee - -	9	10		Afternoon.
In Apogee - -	21	7		Afternoon.

Moon's declination at noon.

M.D.	° '	M.D.	° '	M.D.	° '	M.D.	° '
1	14 S.21	9	12 S.45	17	23 N.55	25	1 N.51
2	18 25	10	7 6	18	24 21	26	3 S.15
3	21 38	11	1 4	19	23 36	27	8 18
4	23 44	12	4 N.56	20	21 48	28	13 5
5	24 28	13	10 33	21	19 4	29	17 20
6	23 41	14	15 28	22	15 34	30	20 47
7	21 21	15	19 26	23	11 25	31	23 8
8	17 37	16	23 17	24	6 48		

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for SUNDERLAND add 5 m. | NORTH SHIELDS add 6 m. | LEITH add 13 m.

MARCH, 1899.

WEEK DAY	MONTH DAY	THURSO (near Scrabster pier). APPROXIMATE RISE 6 30, FALL 6 0 — MORNING Time H.M.	Height F.I.	AFTERNOON Time H.M.	Height F.I.	GREENOCK (East dock). APPROXIMATE RISE 6 30, FALL 6 0 — MORNING Time H.M.	Height F.I.	AFTERNOON Time H.M.	Height F.I.	LIVERPOOL (George pier). APPROXIMATE RISE 5 35, FALL 6 50 — MORNING Time H.M.	Height F.I.	AFTERNOON Time H.M.	Height F.I.	☾'S AGE AT NOON (D.)
W.	1	10 29	12 9	10 46	12 7	1 57	9 9	2 12	9 8	1 8	26 4	1 24	26 7	19·1
Th.	2	11 4	12 2	11 24	11 10	2 28	9 7	2 45	9 6	1 40	25 6	1 56	25 6	20·1
F.	3	11 46	11 5	—	—	3 2	9 5	3 20	9 3	2 13	24 8	2 31	24 1	21·1
S.	4	0 10	11 0	0 36	10 7	3 40	9 1	4 3	8 11	2 52	23 5	3 15	22 6	22·1
S.	5	1 4	10 2	1 36	9 10	4 29	8 9	4 58	8 7	3 40	22 1	4 11	20 9	☾
M.	6	2 17	9 6	3 4	9 4	5 33	8 5	6 14	8 3	4 50	20 10	5 36	19 10	24·1
Tu.	7	3 56	9 4	4 46	9 6	7 0	8 2	7 50	8 3	6 27	21 0	7 18	20 0	25·1
W.	8	5 29	9 11	6 4	10 6	8 35	8 6	9 13	8 9	8 3	22 6	8 40	22 0	26·1
Th.	9	6 33	11 3	6 56	12 0	9 46	9 0	10 15	9 4	9 10	24 6	9 36	24 7	27·1
F.	10	7 17	12 7	7 37	13 5	10 40	9 7	11 5	9 9	10 0	26 11	10 22	26 8	28·1
S.	11	7 57	13 11	8 16	14 4	11 30	9 11	11 54	10 1	10 44	28 8	11 6	28 0	●
S.	12	8 35	14 7	8 54	14 8	—	—	0 16	10 3	11 28	29 9	11 49	28 9	0·7
M.	13	9 13	14 7	9 33	14 4	0 37	10 3	0 58	10 4	—	—	0 10	30 2	1·7
Tu.	14	9 53	14 1	10 13	13 8	1 18	10 3	1 38	10 2	0 30	28 7	0 49	29 5	2·7
W.	15	10 33	13 3	10 53	12 6	1 57	10 1	2 16	9 11	1 8	27 6	1 26	27 8	3·7
Th.	16	11 14	12 2	11 36	11 6	2 34	9 9	2 53	9 6	1 44	26 0	2 3	25 8	4·7
F.	17	11 59	10 11	—	—	3 12	9 3	3 31	9 0	2 22	24 1	2 42	23 6	5·7
S.	18	0 22	10 4	0 47	9 9	3 51	8 9	4 13	8 6	3 3	22 2	3 25	21 5	6·7
S.	19	1 15	9 8	1 49	10 1	4 38	8 4	5 7	7 8	3 51	20 2	4 22	19 6	☽
M.	20	2 29	8 6	3 15	8 4	5 42	7 11	6 23	7 9	5 0	19 0	5 46	18 4	8·7
Tu.	21	4 2	8 4	4 46	8 5	7 6	7 8	7 50	7 9	6 33	19 1	7 19	19 3	9·7
W.	22	5 25	8 8	5 58	9 0	8 30	7 11	9 6	8 1	7 58	20 0	8 32	20 9	10·7
Th.	23	6 25	9 6	6 45	10 0	9 36	8 4	10 6	8 8	9 0	21 8	9 23	22 1	11·7
F.	24	7 2	10 11	7 16	11 3	10 20	8 9	10 38	8 11	9 42	23 4	10 0	23 8	12·7
S.	25	7 30	11 9	7 44	12 3	10 56	9 1	11 14	9 3	10 16	24 9	10 30	25 0	13·7
S.	26	7 58	12 8	8 12	12 11	11 32	9 4	11 49	9 5	10 45	25 10	11 26	26 1	14·7
M.	27	8 26	13 2	8 41	13 3	—	—	0 6	9 7	11 17	26 10	11 34	26 8	○
Tu.	28	8 56	13 4	9 12	13 5	0 22	9 8	0 39	9 9	11 51	27 5	—	—	16·7
W.	29	9 29	13 4	9 46	13 2	0 56	9 9	1 13	9 10	0 8	27 5	0 25	27 5	17·7
Th.	30	10 4	13 0	10 23	12 8	1 31	9 9	1 49	9 9	0 42	27 0	0 59	26 9	18·7
F.	31	10 43	12 4	11 5	12 0	2 7	9 8	2 26	9 7	1 17	26 5	1 36	25 8	19·7

Half mean spring range. — Thurso **6ft. 7in.** — Greenock **4ft. 10in.** — Liverpool **13ft. 9in.**

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	12 32	Sub.	9	10 42	Sub.	17	8 31	Sub.	25	6 6	Sub.
2	12 19		10	10 27		18	8 13		26	5 47	
3	12 7		11	10 11		19	7 55		27	5 29	
4	11 54		12	9 55		20	7 37		28	5 10	
5	11 40		13	9 39		21	7 19		29	4 52	
6	11 26		14	9 22		22	7 1		30	4 34	
7	11 12		15	9 5		23	6 43		31	4 15	
8	10 57		16	8 48		24	6 24				

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for THURSO add 14 m. | GREENOCK add 19 m. | LIVERPOOL add 12 m.

MARCH, 1899.

WEEK DAY.	MONTH DAY.	MOON'S TRANSIT.	PEMBROKE (H.M. Dockyard). APPROXIMATE- { RISE 6 10 / FALL 6 20 } MORNING Time H.M.	Height F.I.	AFTERNOON Time H.M.	Height F.I.	PORTISHEAD (Dock entr.). APPROXIMATE- { RISE 5 40 / FALL 6 40 } MORNING Time H.M.	Height F.I.	AFTERNOON Time H.M.	Height F.I.	HOLYHEAD (Pier). APPROXIMATE- { RISE 6 20 / FALL 6 0 } MORNING Time H.M.	Height F.I.	AFTERNOON Time H.M.	Height F.I.
W.	1	2m34	8 12	22 1	8 29	21 9	9 11	41 2	9 27	40 9	—		0 10	15 8
Th.	2	3 21	8 46	21 5	9 4	20 11	9 43	40 2	9 59	39 5	0 28	15 5	0 47	15 2
F.	3	+ 13	9 23	20 5	9 43	19 9	10 17	38 6	10 33	37 5	1 6	14 10	1 27	14 6
S.	4	5 7	10 4	19 2	10 26	18 6	10 55	36 3	11 17	34 11	1 50	14 1	2 16	13 8
S.	5	6 5	10 51	17 10	11 21	17 2	11 41	33 6	—		2 45	13 3	3 18	12 10
M.	6	7 5	11 59	16 10	—		0 14	32 5	0 55	31 8	3 58	12 7	4 45	12 5
Tu.	7	8 5	0 43	16 10	1 34	17 2	1 42	31 8	2 33	32 4	5 33	12 7	6 20	12 11
W.	8	9 3	2 24	17 10	3 7	18 9	3 23	33 9	4 8	35 6	7 1	13 4	7 36	13 10
Th.	9	10 0	3 42	19 10	4 13	20 10	4 46	37 5	5 17	39 4	8 6	14 5	8 32	15 1
F.	10	10 54	4 42	21 10	5 9	22 8	5 45	41 0	6 11	42 4	8 55	15 8	9 17	16 2
S.	11	11 46	5 34	23 4	5 58	23 10	6 35	43 7	6 58	44 6	9 39	16 6	10 0	16 12
S.	12	ca37	6 20	24 2	6 41	24 5	7 20	45 3	7 40	45 7	10 20	17 1	10 39	17 2
M.	13	1 28	7 1	24 5	7 21	24 3	8 0	45 6	8 19	45 1	10 58	17 3	11 16	17 1
Tu.	14	2 19	7 39	23 11	7 58	23 4	8 38	44 5	8 57	43 6	11 35	16 10	11 54	16 6
W.	15	3 11	8 17	22 9	8 36	22 1	9 15	42 6	9 32	41 5	—		0 14	16 1
Th.	16	4 3	8 55	21 4	9 14	20 6	9 49	40 1	10 6	38 8	0 35	15 7	0 56	15 1
F.	17	4 56	9 33	19 8	9 52	18 9	10 24	37 2	10 43	35 8	1 18	14 6	1 40	14 0
S.	18	5 47	10 11	18 0	10 32	17 1	11 2	34 0	11 22	32 2	2 3	13 5	2 27	12 11
S.	19	6 37	10 57	16 3	11 27	15 8	11 47	30 9	—		2 56	12 5	3 30	12 0
M.	20	7 25	—		0 11	15 5	0 21	29 7	1 3	28 11	4 10	11 8	4 54	11 6
Tu.	21	8 12	0 47	15 4	1 34	15 6	1 49	28 11	2 35	29 5	5 39	11 8	6 20	11 10
W.	22	8 56	2 18	16 0	2 57	16 8	3 18	30 4	3 58	31 8	6 57	12 2	7 29	12 6
Th.	23	9 38	3 30	17 5	3 55	18 3	4 34	33 1	5 2	34 6	7 57	13 0	8 19	13 5
F.	24	10 21	4 18	19 0	4 38	19 8	5 23	35 10	5 42	37 1	8 38	13 11	8 54	14 4
S.	25	11 3	4 58	20 4	5 17	20 11	6 1	38 2	6 19	39 2	9 10	14 9	9 26	15 1
S.	26	11 46	5 35	21 4	5 53	21 9	6 37	40 1	6 54	40 10	9 41	15 4	9 56	15 7
M.	27	m.	6 10	22 1	6 26	22 4	7 10	41 6	7 26	42 0	10 11	15 9	10 26	15 11
Tu.	28	0 31	6 42	22 7	6 58	22 8	7 42	42 3	7 58	42 4	10 41	16 0	10 55	16 1
W.	29	1 18	7 14	22 8	7 31	22 6	8 14	42 3	8 31	41 11	11 10	16 0	11 26	15 11
Th.	30	2 9	7 49	22 4	8 7	22 0	8 48	41 6	9 5	41 1	11 44	15 10	—	
F.	31	3 3	8 26	21 7	8 47	21 2	9 23	40 6	9 41	39 9	0 4	15 7	0 25	15 4

Half mean spring range.	11ft. 3in.	21ft. 0in.	8ft. 0in.

Phases of the moon.

	D.	H.	M.	
Last Quarter -	5	4	7	Morning.
New - - - -	11	7	53	Afternoon.
First Quarter -	19	3	24	Morning.
Full - - -	27	6	18	Morning.
In Perigee - -	9	10		Afternoon.
In Apogee - -	21	7		Afternoon.

Moon's declination at noon.

M.D.	o	'	M.D.	o	'	M.D.	o	'	M.D.	o	'
1	14 S.	21	9	12 S.	45	17	23 N.	55	25	1 N.	51
2	18	25	10	7	6	18	24	21	26	3 S.	15
3	21	38	11	1	4	19	23	36	27	8	18
4	23	44	12	4 N.	56	20	21	48	28	13	5
5	24	28	13	10	33	21	19	4	29	17	20
6	23	41	14	15	28	22	15	34	30	20	47
7	21	21	15	19	26	23	11	25	31	23	8
8	17	37	16	23	17	24	6	48			

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for PEMBROKE add 20 m. | PORTISHEAD add 11 m. | HOLYHEAD add 18 m.

MARCH, 1899.

WEEK DAY	MONTH DAY	KINGSTOWN (Watering pier) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	BELFAST (New dock) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	LONDONDERRY (Ship bridge) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	☽'s AGE AT NOON. D.
W.	1	0 57	10 9	1 13	10 8	0 32	9 4	0 49	9 4	9 56	7 4	10 11	7 2	19·1
Th.	2	1 30	10 6	1 48	10 4	1 7	9 3	1 25	9 2	10 28	7 0	10 47	6 10	20·1
F.	3	2 7	10 2	2 28	9 11	1 45	9 1	2 7	8 11	11 8	6 7	11 33	6 4	21·1
S.	4	2 51	9 9	3 15	9 6	2 32	8 9	2 58	8 7	—		0 3	6 1	22·1
S.	5	3 43	9 3	4 16	9 0	3 26	8 5	3 59	8 3	0 39	5 9	1 20	5 7	☾
M.	6	4 56	8 10	5 38	8 9	4 37	8 1	5 19	8 0	2 8	5 6	2 56	5 7	24·1
Tu.	7	6 22	8 10	7 6	9 0	6 3	8 0	6 50	8 1	3 41	5 9	4 23	6 1	25·1
W.	8	7 48	9 4	8 26	9 8	7 33	8 3	8 9	8 5	4 58	6 5	5 27	6 8	26·1
Th.	9	8 58	10 0	9 27	10 4	8 40	8 9	9 6	9 1	5 52	7 0	6 16	7 4	27·1
F.	10	9 53	10 8	10 1?	11 0	9 30	9 4	9 53	9 7	6 40	7 7	7 4	7 10	28·1
S.	11	10 37	11 3	10 5?	11 6	10 15	9 9	10 36	9 10	7 27	8 1	7 49	8 3	●
S.	12	11 17	11 8	11 37	11 9	10 58	9 11	11 16	10 0	8 10	8 5	8 29	8 6	0·7
M.	13	11 57	11 8	—		11 35	9 11	11 54	9 10	8 48	8 5	9 6	8 4	1·7
Tu.	14	0 17	11 7	0 37	11 5	—		0 13	9 9	9 24	8 1	9 42	7 10	2·7
W.	15	0 57	11 2	1 17	10 11	0 33	9 8	0 53	9 6	9 59	7 7	10 17	7 4	3·7
Th.	16	1 37	10 7	1 57	10 3	1 13	9 4	1 34	9 2	10 36	7 0	10 57	6 8	4·7
F.	17	2 18	10 0	2 40	9 8	1 57	9 0	2 21	8 9	11 21	6 4	11 49	5 11	5·7
S.	18	3 2	9 4	3 26	9 0	2 45	8 6	3 10	8 3	—		0 20	5 7	6·7
S.	19	3 54	8 9	4 28	8 6	3 38	8 1	4 9	7 11	0 57	5 3	1 37	5 1	☽
M.	20	5 5	8 4	5 46	8 2	4 46	7 9	5 27	7 8	2 20	5 0	3 4	5 1	8·7
Tu.	21	6 28	8 3	7 9	8 5	6 9	7 7	6 51	7 8	3 47	5 3	4 25	5 6	9·7
W.	22	7 46	8 8	8 19	8 11	7 30	7 9	8 4	7 11	4 57	5 9	5 24	5 11	10·7
Th.	23	8 48	9 2	9 12	9 5	8 32	8 1	8 53	8 4	5 47	6 2	6 5	6 4	11·7
F.	24	9 34	9 8	9 52	9 11	9 11	8 7	9 28	8 10	6 22	6 7	6 38	6 10	12·7
S.	25	10 9	10 2	10 24	10 4	9 44	9 0	0 10	9 2	6 55	7 0	7 12	7 2	13·7
S.	26	10 39	10 6	10 54	10 8	10 16	9 3	10 31	9 4	7 29	7 4	7 45	7 6	14·7
M.	27	11 8	10 11	11 23	10 11	10 46	9 5	11 9	9 5	8 1	7 7	8 16	7 9	○
Tu.	28	11 39	11 0	0 11	11 0	11 16	9 6	11 32	9 6	8 31	7 10	8 46	7 10	16·7
W.	29	—		0 13	10 11	11 48	9 5	—		9 1	7 9	9 17	7 8	17·7
Th.	30	0 30	10 10	0 48	10 9	0 5	9 5	0 24	9 4	9 33	7 6	9 50	7 4	18·7
F.	31	1 7	10 8	1 27	10 6	0 43	9 4	1 3	9 3	10 8	7 2	10 28	6 11	19·7

Half mean spring range: Kingstown 5ft. 6in. | Belfast 4ft. 9in. | Londonderry 3ft. 10in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	12 32	Sub.	9	10 42	Sub.	17	8 31	Sub.	25	6 6	Sub.
2	12 19		10	10 27		18	8 13		26	5 47	
3	12 7		11	10 11		19	7 55		27	5 29	
4	11 54		12	9 55		20	7 37		28	5 10	
5	11 40		13	9 39		21	7 19		29	4 52	
6	11 26		14	9 22		22	7 1		30	4 34	
7	11 12		15	9 5		23	6 43		31	4 15	
8	10 57		16	8 48		24	6 24				

The times of high water are given for Mean time at place; if Dublin or Railway time be required,—for KINGSTOWN *subtract* 1 m. for Dublin time. | BELFAST *subtract* 2 m. | LONDONDERRY *add* 4 m.

MARCH, 1899.

Week Day	Month Day	Moon's Transit H. M.	SLIGO BAY (Mullaghmore) Morning Time H. M.	Morning Height F. I.	Afternoon Time H. M.	Afternoon Height F. I.	GALWAY (Nimmo pier) Morning Time H. M.	Morning Height F. I.	Afternoon Time H. M.	Afternoon Height F. I.	QUEENSTOWN (Scott's wharf) Morning Time H. M.	Morning Height F. I.	Afternoon Time H. M.	Afternoon Height F. I.
			Approximate { Rise 6 10 / Fall 6 20				Approximate { Rise 6 30 / Fall 6 0				Approximate { Rise 6 5 / Fall 6 25			
W.	1	2m34	7 18	10 9	7 35	10 6	6 38	14 6	6 55	14 3	7 5	11 7	7 21	11 5
Th.	2	3 21	7 52	10 3	8 9	10 0	7 13	13 11	7 32	13 7	7 38	11 2	7 55	10 11
F.	3	4 13	8 29	9 8	8 52	9 4	7 52	13 2	8 14	12 8	8 13	10 8	8 33	10 4
S.	4	5 7	9 18	9 0	9 50	8 8	8 40	12 1	9 8	11 6	8 55	10 0	9 19	9 9
Su.	5	6 5	10 26	8 5	11 7	8 3	9 38	11 1	10 16	10 9	9 45	9 5	10 18	9 2
M.	6	7 5	11 52	8 3	—		11 0	10 8	11 49	10 9	10 59	9 0	11 46	9 0
Tu.	7	8 5	0 39	8 4	1 25	8 6	—		0 37	11 1	—		0 34	9 2
W.	8	9 3	2 7	8 10	2 43	9 4	1 19	11 7	1 54	12 3	1 21	9 6	2 3	9 11
Th.	9	10 0	3 11	9 10	3 36	10 4	2 27	12 11	2 50	13 8	2 38	10 5	3 7	10 11
F.	10	10 54	3 58	10 10	4 20	11 3	3 15	14 3	3 38	14 10	3 34	11 4	3 59	11 9
S.	11	11 46	4 42	11 8	5 4	11 11	4 1	15 4	4 23	15 9	4 23	12 2	4 46	12 5
Su.	12	0a37	5 25	12 2	5 45	12 3	4 44	16 0	5 4	16 3	5 8	12 7	5 30	12 9
M.	13	1 28	6 5	12 3	6 24	12 1	5 24	16 4	5 44	16 1	5 51	12 9	6 11	12 8
Tu.	14	2 19	6 43	11 6	7 2	11 6	6 4	15 10	6 23	15 5	6 30	12 6	6 49	12 3
W.	15	3 11	7 21	11 1	7 40	10 8	6 42	15 0	7 2	14 7	7 8	11 11	7 27	11 6
Th.	16	4 3	7 59	10 2	8 19	9 8	7 22	13 10	7 43	13 3	7 46	11 2	8 5	10 9
F.	17	4 56	8 41	9 3	9 3	9 8	8 5	12 7	8 27	11 10	8 24	10 4	8 43	9 10
S.	18	5 47	9 32	8 5	10 3	8 0	8 52	11 2	9 18	10 6	9 3	9 5	9 25	9 0
Su.	19	6 37	10 39	7 9	11 19	7 7	9 48	10 0	10 25	9 8	9 51	8 8	10 25	8 5
M.	20	7 25	—		noon.	7 6	11 9	9 7	11 55	9 8	11 7	8 3	11 52	8 3
Tu.	21	8 12	0 43	7 7	1 25	7 8	—		0 38	9 10	—		0 37	8 5
W.	22	8 56	2 3	7 11	2 36	8 3	1 15	10 2	1 47	10 8	1 18	8 7	1 55	8 11
Th.	23	9 38	3 3	8 7	3 24	9 0	2 14	11 2	2 36	11 8	2 26	9 3	2 51	9 7
F.	24	10 21	3 42	9 5	3 58	9 9	2 56	12 2	3 14	12 8	3 13	9 11	3 32	10 3
S.	25	11 3	4 13	10 1	4 28	10 5	3 31	13 1	3 47	13 6	3 50	10 7	4 8	10 11
Su.	26	11 46	4 43	10 8	4 58	10 11	4 2	13 10	4 18	14 2	4 25	11 2	4 42	11 4
M.	27	m.	5 14	11 1	5 30	11 3	4 34	14 5	4 50	14 8	4 59	11 7	5 15	11 9
Tu.	28	0 31	5 46	11 4	6 2	11 4	5 6	14 10	5 22	15 0	5 32	11 9	5 49	11 10
W.	29	1 18	6 18	11 3	6 35	11 2	5 39	14 11	5 56	14 10	6 6	11 10	6 23	11 9
Th.	30	2 9	6 53	11 0	7 12	10 9	6 14	14 8	6 33	14 5	6 41	11 8	6 59	11 6
F.	31	3 3	7 31	10 5	7 51	10 1	6 53	14 1	7 14	13 9	7 18	11 4	7 38	11 1
Half mean spring range			5ft. 7in.				7ft. 5in.				5ft. 10in.			

Phases of the moon.

	D.	H.	M.	
Last Quarter -	5	4	7	Morning.
New - - - -	11	7	53	Afternoon.
First Quarter -	19	3	24	Morning.
Full - - - -	27	6	18	Morning.
In Perigee -		9	10	Afternoon.
In Apogee -		21	7	Afternoon.

Moon's declination at noon.

M.D.	o '	M.D.	o '	M.D.	o '	M.D.	o '
1	14 S.21	9	12 S.45	17	23 N.55	25	1 N.51
2	18 25	10	7 6	18	24 21	26	3 S.15
3	21 38	11	1 4	19	23 36	27	8 18
4	23 44	12	4 N.56	20	21 48	28	13 5
5	24 28	13	10 33	21	19 4	29	17 20
6	23 41	14	15 28	22	15 34	30	20 47
7	21 21	15	19 26	23	11 25	31	23 8
8	17 37	16	23 17	24	6 48		

The times of high water are given for Mean time at place ; if Dubin or Railway time be required,—for
SLIGO BAY *add* 9 m. | GALWAY *add* 11 m. | QUEENSTOWN *add* 8 m.

MARCH, 1899.

WEEK DAY	MONTH DAY	WATERFORD (Duncannon fort). APPROXIMATE- { RISE 6 5 / FALL 6 20												D'S AGE AT NOON.
		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.			
		Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	D.
W.	1	7 27	12 4	7 43	12 3									19·1
Th.	2	7 59	12 1	8 15	11 11									20·1
F.	3	8 32	11 8	8 51	11 4									21·1
S.	4	9 11	11 1	9 34	10 9									22·1
S.	5	10 2	10 5	10 39	10 1									☾
M.	6	11 20	9 10	—	—									24·1
Tu.	7	0 3	9 9	0 48	9 11									25·1
W.	8	1 31	10 3	2 12	10 8									26·1
Th.	9	2 49	11 2	3 22	11 8									27·1
F.	10	3 52	12 2	4 19	12 6									28·1
S.	11	4 45	12 10	5 9	13 1									●
S.	12	5 31	13 3	5 51	13 4									0·7
M.	13	6 11	13 5	6 31	13 4									1·7
Tu.	14	6 51	13 2	7 10	12 11									2·7
W.	15	7 29	12 8	7 47	12 5									3·7
Th.	16	8 5	12 1	8 23	11 9									4·7
F.	17	8 41	11 4	8 59	10 10									5·7
S.	18	9 18	10 5	9 41	10 0									6·7
S.	19	10 11	9 8	10 47	9 4									☽
M.	20	11 27	9 1	—	—									8·7
Tu.	21	0 9	9 0	0 49	9 2									9·7
W.	22	1 27	9 4	2 3	9 8									10·7
Th.	23	2 35	10 0	3 3	10 4									11·7
F.	24	3 27	10 9	3 48	11 1									12·7
S.	25	4 8	11 4	4 27	11 8									13·7
S.	26	4 46	11 11	5 4	12 1									14·7
M.	27	5 21	12 3	5 37	12 4									○
Tu.	28	5 53	12 5	6 9	12 6									16·7
W.	29	6 26	12 6	6 44	12 6									17·7
Th.	30	7 2	12 5	7 20	12 4									18·7
F.	31	7 38	12 2	7 57	12 0									19·7

Half mean spring range } 6ft. 2in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.			M. S.	
1	12 32	Sub.	9	10 42	Sub.	17	8 31	Sub.		6 6	Sub.
2	12 19		10	10 27		18	8 13			5 47	
3	12 7		11	10 11		19	7 55			5 29	
4	11 54		12	9 55		20	7 37			5 10	
5	11 40		13	9 39		21	7 19			4 52	
6	11 26		14	9 22		22	7 1			4 34	
7	11 12		15	9 5		23	6 43			4 15	
8	10 57		16	8 48		24	6 24				

The times of high water are given for Mean time at place; if Dublin or Railway t...
WATERFORD add 3 m.

...be required,—for

APRIL, 1899.

Week Day	Month Day	Moon's Transit H. M.	BREST (Entr. of Dockyard basin) Approximate Rise 6 10 / Fall 6 20 — Morning Time H. M.	F.	L.	Afternoon Time H. M.	F.	L.	DEVONPORT (H.M. Dockyard) High Water Approximate Rise 6 0 / Fall 6 10 — Morning Time H. M.	F.	L.	Afternoon Time H. M.	F.	L.	Low Water Morning Time H. M.	F.	L.	Afternoon Time H. M.	F.	L.
S.	1	4m 0	6 40	17	2	7 3	16	5	8 28	14	3	8 48	14	4	2 26	1	1	2 44	1	9
S.	2	4 59	7 29	15	9	7 58	15	0	9 9	13	7	9 33	13	9	3 3	1	10	3 23	2	9
M.	3	5 58	8 31	14	5	9 8	14	0	10 1	12	9	10 34	13	2	3 44	2	8	4 11	3	10
Tu.	4	6 55	9 50	13	10	10 36	14	0	11 12	12	0	11 56	12	10	4 46	3	6	5 28	4	8
W.	5	7 51	11 22	14	5	—	—	—	—	—	—	0 43	12	2	6 13	3	11	6 59	4	7
Th.	6	8 44	0 4	15	0	0 41	15	9	1 29	13	5	2 11	13	0	7 43	3	1	8 27	3	5
F.	7	9 35	1 12	16	6	1 38	17	5	2 49	14	4	3 22	13	11	9 6	1	11	9 39	2	2
S.	8	10 25	2 1	18	1	2 24	18	5	3 50	15	2	4 16	14	11	10 7	0	10	10 32	1	0
S.	9	11 15	2 45	19	5	3 6	19	10	4 41	15	10	5 4	15	7	10 55	*0	1	11 18	0	1
M.	10	0 a 6	3 27	20	0	3 48	20	0	5 25	16	2	5 46	15	11	11 40	*0	7	—	—	—
Tu.	11	0 58	4 8	19	11	4 28	19	9	6 6	16	1	6 26	15	11	0 1	*0	5	0 21	*0	4
W.	12	1 51	4 48	19	6	5 7	19	1	6 45	15	10	7 3	15	7	0 41	*0	6	1 0	*0	4
Th.	13	2 44	5 25	18	7	5 43	18	1	7 20	15	3	7 37	15	2	1 18	0	1	1 36	0	4
F.	14	3 37	6 2	17	6	6 22	16	10	7 54	14	6	8 11	14	5	1 53	0	8	2 10	1	4
S.	15	4 29	6 42	16	1	7 3	15	4	8 27	13	7	8 43	13	8	2 26	1	6	2 41	2	5
S.	16	5 18	7 26	14	7	7 50	13	11	9 0	12	8	9 20	12	11	2 57	2	7	3 13	3	8
M.	17	6 5	8 17	13	4	8 47	12	11	9 43	11	8	10 9	12	2	3 31	3	7	3 52	4	10
Tu.	18	6 50	9 22	12	9	10 2	12	8	10 40	10	11	11 16	11	9	4 20	4	6	4 55	5	9
W.	19	7 33	10 42	12	9	11 19	13	1	11 56	10	11	—	—	—	5 33	5	1	6 12	5	10
Th.	20	8 15	11 54	13	6	—	—	—	0 36	12	0	1 15	11	5	6 51	4	9	7 29	5	2
F.	21	8 57	0 25	14	0	0 53	14	7	1 51	12	7	2 24	12	3	8 5	3	10	8 39	4	1
S.	22	9 40	1 17	15	2	1 39	15	10	2 53	13	4	3 19	13	3	9 9	2	10	9 36	2	9
S.	23	10 24	1 58	16	6	2 16	17	1	3 42	14	2	4 4	14	1	9 59	1	11	10 20	1	0
M.	24	11 11	2 34	17	8	2 52	18	2	4 25	14	9	4 46	14	9	10 40	1	1	11 0	1	0
Tu.	25	m.	3 10	18	6	3 28	18	10	5 6	15	2	5 24	15	3	11 20	0	6	11 39	0	5
W.	26	0 2	3 46	19	1	4 5	19	0	5 42	15	4	6 1	15	5	11 58	0	2	0 0	0	5
Th.	27	0 56	4 24	19	1	4 44	19	0	6 20	15	6	6 39	15	7	0 16	0	0	0 35	0	0
F.	28	1 53	5 4	18	10	5 25	18	7	6 58	15	3	7 18	15	5	0 54	0	0	1 13	0	4
S.	29	2 53	5 46	18	3	6 9	17	11	7 38	14	11	7 58	15	2	1 33	0	3	1 53	0	9
S.	30	3 53	6 33	17	4	6 59	16	9	8 20	14	5	8 42	14	9	2 13	0	7	2 34	1	6

Half mean spring range. — BREST 9ft. 6in. — DEVONPORT 7ft. 9in.

Phases of the moon.

	D.	H.	M.	
Last Quarter	3	11	56	Morning.
New	10	6	21	Morning.
First Quarter	17	10	43	Afternoon.
Full	25	7	22	Afternoon.
In Perigee	6	1		Afternoon.
In Apogee	18	2		Afternoon.

Moon's declination at noon.

M.D.	o	'	M.D.	o	'	M.D.	o	'	M.D.	o	'
1	24 S. 11		9	8 N.19		17	19 N.48		25	16 S. 1	
2	23	45	10	13	28	18	16	33	26	19	46
3	21	50	11	17	48	19	12	37	27	22	29
4	18	34	12	21	7	20	8	11	28	23	53
5	14	10	13	23	13	21	3	23	29	23	47
6	8	56	14	24	5	22	1 S.37		30	22	10
7	3	13	15	23	44	23	6	41			
8	2 N.39		16	22	15	24	11	34			

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for BREST *add* 18 m. | DEVONPORT *add* 17 m.
* Below zero, or datum to which soundings on charts are reduced.

APRIL, 1899.

PORTSMOUTH (*H. M. Dockyard*). — High Water — Approximate { Rise 7 20, Fall 5 10 } H. M. — Low Water

DOVER (*North pier*). — Approximate { Rise 5 0, Fall 7 30 } H. M.

Week Day	Month Day	HW Morning Time H.M.	HW Morning Height F.I.	HW Afternoon Time H.M.	HW Afternoon Height F.I.	LW Morning Time H.M.	LW Morning Height F.I.	LW Afternoon Time H.M.	LW Afternoon Height F.I.	Dover Morning Time H.M.	Dover Morning Height F.I.	Dover Afternoon Time H.M.	Dover Afternoon Height F.I.	☾'s Age at Noon
S.	1	2 20	12 9	2 41	12 6	7 16	1 1	7 36	1 6	2 0	17 10	2 22	17 5	20·7
S.	2	3 4	12 2	3 28	11 10	8 0	2 0	8 29	2 5	2 45	16 11	3 9	16 5	21·7
M.	3	3 56	11 6	4 28	11 2	9 1	2 11	9 40	3 4	3 37	15 10	4 8	15 4	☾
Tu.	4	5 3	10 11	5 43	10 9	10 23	3 8	11 10	3 8	4 42	14 10	5 18	14 7	23·7
W.	5	6 27	10 9	7 11	10 11	—	—	noon.	3 6	5 58	14 7	6 38	15 0	24·7
Th.	6	7 52	11 4	8 30	11 9	0 45	3 2	1 22	2 7	7 18	15 6	7 55	16 2	25·7
F.	7	9 2	12 3	9 30	12 8	1 53	2 0	2 18	1 5	8 27	16 10	8 54	17 6	26·7
S.	8	9 56	13 1	10 20	13 5	2 42	0 11	3 5	0	9 19	18 0	9 44	18 6	27·7
S.	9	10 41	13 8	11 2	13 10	3 27	0 1	3 48	*0	10 7	18 11	10 30	19 2	28·7
M.	10	11 23	13 11	11 41	14 0	4 9	*0	4 29	*0	10 53	19 4	11 16	19 5	●
Tu.	11	—	—	0 5	13 11	4 49	*0	5 8	*0	11 38	19 4	mid.	19 3	1·2
W.	12	0 26	13 10	0 46	13 8	5 27	*0	5 46	*0	—	—	0 21	19 1	2·2
Th.	13	1 6	13 5	1 26	13 2	6 5	0 1	6 24	0 4	0 41	18 9	1 1	18 5	3·2
F.	14	1 45	12 10	2 4	12 7	6 43	0 9	7 1	1 2	1 21	18 0	1 41	17 7	4·2
S.	15	2 23	12 3	2 43	11 11	7 19	1 8	7 38	2 2	2 1	17 1	2 23	16 6	5·2
S.	16	3 3	11 6	3 25	11 2	7 59	2 7	8 24	3 1	2 45	16 0	3 7	15 6	6·2
M.	17	3 48	10 11	4 14	10 7	8 54	3 7	9 27	4 0	3 29	15 0	3 53	14 6	☽
Tu.	18	4 43	10 4	5 16	10 2	10 2	4 2	10 40	4 3	4 21	14 0	4 52	13 9	8·2
W.	19	5 53	10 1	6 31	10 1	11 22	4 3	—	—	5 26	13 7	6 0	13 7	9·2
Th.	20	7 7	10 3	7 41	10 6	0 4	4 3	0 41	3 11	6 34	13 11	7 7	14 3	10·2
F.	21	8 13	10 10	8 42	11 2	1 13	3 6	1 40	3 0	7 39	14 9	8 8	15 3	11·2
S.	22	9 8	11 6	9 31	11 10	2 3	2 7	2 24	2 2	8 33	15 9	8 54	16 3	12·2
S.	23	9 52	12 2	10 11	12 6	2 43	1 9	3 1	1 4	9 14	16 8	9 34	17 1	13·2
M.	24	10 30	12 9	10 48	13 0	3 18	1 0	3 36	0 9	9 54	17 6	10 14	17 11	14·2
Tu.	25	11 6	13 2	11 24	13 4	3 54	0 6	4 12	0 4	10 34	18 2	10 54	18 5	O
W.	26	11 42	13 5	—	—	4 30	0 2	4 48	0 1	11 14	18 6	11 34	18 7	16·2
Th.	27	0 2	13 6	0 22	13 6	5 6	0 0	5 24	0 1	11 55	18 8	—	—	17·2
F.	28	0 43	13 5	1 4	13 3	5 43	0 1	6 3	0 2	0 17	18 8	0 39	18 6	18·2
S.	29	1 26	13 1	1 48	12 11	6 24	0 5	6 45	0 8	1 2	18 4	1 26	18 2	19·2
S.	30	2 10	12 9	2 33	12 7	7 6	1 0	7 29	1 5	1 50	17 11	2 15	17 7	20·2

Half mean spring range } 6ft. 9in.   9ft. 4in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	3 57	Sub.	9	1 38	Sub.	17	0 25	Add.	25	2 5	Add.
2	3 39		10	1 21		18	0 39		26	2 15	
3	3 21		11	1 5		19	0 53		27	2 25	
4	3 3		12	0 49		20	1 6		28	2 35	
5	2 46		13	0 34		21	1 18		29	2 43	
6	2 28		14	0 18		22	1 31		30	2 52	
7	2 11		15	0 3		23	1 43				
8	1 54		16	0 11	Add.	24	1 54				

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for PORTSMOUTH *add* 4 m. | DOVER *subtract* 5 m.
* Below zero, or datum to which soundings on charts are reduced.

APRIL, 1899.

WEEK DAY.	MONTH DAY.	MOON'S TRANSIT.	SHEERNESS (H.M. Dockyard). APPROXIMATE - { RISE 6 5 / FALL 6 25				High Water.				CHATHAM (H.M. Dockyard). APPROXIMATE - { RISE 6 35 / FALL 6 5				Low Water.			
			MORNING.		AFTERNOON.		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.					
			Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.				
S.	1	4m 0	3 28	15 6	3 48	15 3	3 35	17 4	3 55	17 0	9 48	1 0	10 4	1 3				
S.	2	4 59	4 10	14 11	4 34	14 6	4 16	16 8	4 39	16 2	10 22	1 6	10 42	1 10				
M.	3	5 58	5 0	14 1	5 30	13 9	5 3	15 8	5 33	15 3	11 5	2 3	11 33	2 10				
Tu.	4	6 55	6 5	13 5	6 46	13 2	6 9	14 11	6 50	14 8	—	—	0 8	3 3				
W.	5	7 51	7 31	13 2	8 17	13 3	7 35	14 7	8 22	14 8	0 52	3 4	1 42	3 0				
Th.	6	8 44	9 2	13 8	9 42	14 1	9 7	15 0	9 50	15 7	2 33	2 7	3 21	2 2				
F.	7	9 35	10 17	14 6	10 46	15 0	10 27	16 2	10 56	16 9	4 3	1 9	4 39	1 3				
S.	8	10 25	11 12	15 6	11 36	15 10	11 20	17 3	11 42	17 9	5 8	0 10	5 34	0 5				
S.	9	11 15	11 58	16 2	—	—	—	—	0 3	18 2	6 0	0 1	6 24	*0 2				
M.	10	0a 6	0 19	16 5	0 40	16 8	0 24	18 6	0 45	18 9	6 46	*0 3	7 8	*0 4				
Tu.	11	0 58	1 0	16 9	1 20	16 9	1 6	18 11	1 27	18 11	7 29	*0 5	7 50	*0 5				
W.	12	1 51	1 40	16 8	2 0	16 6	1 47	18 10	2 6	18 8	8 10	*0 4	8 29	*0 3				
Th.	13	2 44	2 19	16 4	2 37	16 1	2 24	18 4	2 42	18 0	8 47	0 0	9 3	0 4				
F.	14	3 37	2 55	15 9	3 13	15 5	3 1	17 8	3 20	17 3	9 19	0 9	9 35	1 1				
S.	15	4 29	3 32	15 1	3 52	14 8	3 39	16 10	3 58	16 3	9 50	1 6	10 6	1 10				
S.	16	5 18	4 12	14 3	4 33	13 9	4 17	15 11	4 37	15 4	10 23	2 3	10 41	2 8				
M.	17	6 5	4 56	13 5	5 22	13 1	4 59	14 10	5 25	14 5	11 1	3 2	11 25	3 8				
Tu.	18	6 50	5 51	12 9	6 24	12 6	5 54	14 1	6 28	13 11	11 54	4 1	—	—				
W.	19	7 33	7 2	12 5	7 42	12 5	7 6	13 9	7 46	13 8	0 29	4 2	1 11	4 0				
Th.	20	8 15	8 21	12 6	8 58	12 10	8 25	13 9	9 3	14 0	1 56	3 9	2 39	3 6				
F.	21	8 57	9 32	13 2	10 2	13 6	9 39	14 5	10 11	14 11	3 18	3 2	3 53	2 10				
S.	22	9 40	10 29	13 10	10 52	14 3	10 39	15 4	11 2	15 9	4 23	2 6	4 50	2 2				
S.	23	10 24	11 13	14 7	11 31	14 10	11 39	16 7	5 14	1 10	5 35	1 6						
M.	24	11 11	11 49	15 2	—	—	11 56	16 11	5 55	1 2	6 15	1 0						
Tu.	25	m.	0 7	15 5	0 25	15 8	0 13	17 3	0 31	17 7	6 34	0 10	6 53	0 8				
W.	26	0 2	0 43	15 10	1 1	16 0	0 49	17 10	1 7	18 0	7 11	0 6	7 29	0 5				
Th.	27	0 56	1 19	16 1	1 37	16 2	1 25	18 2	1 44	18 3	7 48	0 4	8 7	0 3				
F.	28	1 53	1 56	16 1	2 16	16 0	2 3	18 2	2 22	18 0	8 26	0 3	8 44	0 4				
S.	29	2 53	2 36	15 11	2 56	15 9	2 41	17 10	3 1	17 7	9 2	0 6	9 20	0 9				
S.	30	3 53	3 17	15 7	3 39	15 4	3 23	17 4	3 46	17 1	9 38	1 0	9 56	1 2				

Half mean spring range. } 8ft. 0in.   9ft. 1in.

Phases of the moon.

	D.	H.	M.	
Last Quarter	-	3	11	56 Morning.
New - - -	-	10	6	21 Morning.
First Quarter	-	17	10	43 Afternoon.
Full - - -	-	25	7	22 Afternoon.
In Perigee -	-	6	1	Afternoon.
In Apogee -	-	18	2	Afternoon.

Moon's declination at noon.

M.D.	o '	M.D.	o '	M.D.	o '	M.D.	o '
1	24 S. 11	9	8 N. 19	17	19 N. 48	25	16 S. 1
2	23 45	10	13 28	18	16 33	26	19 46
3	21 50	11	17 48	19	12 37	27	22 29
4	18 34	12	21 7	20	8 11	28	23 53
5	14 10	13	23 13	21	3 23	29	23 47
6	8 56	14	24 5	22	1 S. 37	30	22 10
7	3 13	15	23 44	23	6 41		
8	2 N. 39	16	22 15	24	11 34		

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required, —for SHEERNESS subtract 3 m.   CHATHAM subtract 2 m.
* Below zero, or datum to which soundings on charts are reduced.

APRIL, 1899.

| | | LONDON (London bridge). Approximate – Rise 5 30, Fall 7 0 | | | | HARWICH (Angel quay). Approximate – Rise 6 25, Fall 6 0 | | | | HULL (Victoria dock). Approximate – Rise 5 40, Fall 6 30 | | | | ☾'s AGE AT NOON |
| | | MORNING | | AFTERNOON | | MORNING | | AFTERNOON | | MORNING | | AFTERNOON | | |
WEEK DAY	MONTH DAY	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	D.
S.	1	4 49	20	5 9	19 10	2 46	11 1	3 7	10 11	9 24	19 7	9 46	19 0	20·7
S.	2	5 31	19 5	5 55	18 11	3 28	10 8	3 50	10 5	10 9	18 5	10 37	17 11	21·7
M.	3	6 20	18 5	6 48	17 11	4 14	10 3	4 43	10 1	11 9	17 5	11 48	16 11	(
Tu.	4	7 22	17 6	8 1	17 3	5 16	9 11	5 54	9 9	—	—	0 30	16 6	23·7
W.	5	8 43	17 4	9 30	17 7	6 38	9 9	7 25	9 10	1 13	16 5	1 54	16 6	24·7
Th.	6	10 16	17 10	10 56	18 3	8 10	10 1	8 50	10 4	2 34	17 0	3 11	17 9	25·7
F.	7	11 32	18 9	—	—	9 25	10 7	9 55	10 11	3 45	18 6	4 14	19 3	26·7
S.	8	0 2	19 4	0 30	19 11	10 22	11 2	10 47	11 5	4 40	19 11	5 3	20 5	27·7
S.	9	0 55	20 4	1 18	20 8	11 10	11 8	11 31	11 10	5 25	20 11	5 47	21 3	28·7
M.	10	1 39	20 11	2 0	21 2	11 52	11 11	—	—	6 9	21 6	6 31	21 7	●
Tu.	11	2 21	21 3	2 41	21 2	0 13	12 0	0 33	11 11	6 52	21 8	7 13	21 7	1·2
W.	12	3 0	21 4	3 19	21 2	0 53	11 10	1 13	11 9	7 33	21 5	7 52	21 3	2·2
Th.	13	3 38	21 0	3 57	20 9	1 33	11 8	1 52	11 6	8 10	20 11	8 29	20 6	3·2
F.	14	4 16	20 5	4 35	20 1	2 11	11 3	2 30	11 0	8 48	19 11	9 8	19 4	4·2
S.	15	4 54	19 8	5 13	19 3	2 50	10 9	3 10	10 6	9 28	18 9	9 48	18 1	5·2
S.	16	5 33	18 1	5 54	18 1	3 30	10 3	3 50	10 1	10 10	17 6	10 34	16 11	6·2
M.	17	6 17	17 8	6 43	17 2	4 12	9 10	4 36	9 8	11 2	16 5	11 34	15 11	)
Tu.	18	7 11	16 9	7 41	16 6	5 3	9 6	5 33	9 5	—	—	0 9	15 7	8·2
W.	19	8 16	16 6	8 56	16 7	6 8	9 4	6 48	9 4	0 46	15 5	1 22	15 4	9·2
Th.	20	9 36	16 9	10 13	17 0	7 28	9 5	8 5	9 7	1 57	15 6	2 30	15 10	10·2
F.	21	10 47	17 3	11 17	17 6	8 39	9 9	9 9	10 0	3 1	16 4	3 30	16 11	11·2
S.	22	11 45	17 11	—	—	9 36	10 3	10 0	10 6	3 57	17 6	4 21	18 1	12·2
S.	23	0 10	18 5	0 32	18 10	10 22	10 9	10 42	10 11	4 42	18 7	5 0	19 1	13·2
M.	24	0 52	19 3	1 10	19 7	11 1	11 1	11 20	11 3	5 18	19 6	5 36	19 10	14·2
Tu.	25	1 28	19 10	1 46	20 6	11 38	11 5	11 56	11 6	5 54	20 2	6 12	20 5	○
W.	26	2 3	20 3	2 20	20 6	—	—	0 14	11 7	6 30	20 7	6 49	20 9	16·2
Th.	27	2 38	20 8	2 56	20 9	0 32	11 7	0 51	11 7	7 9	20 10	7 29	20 11	17·2
F.	28	3 14	20 8	3 33	20 7	1 10	11 6	1 30	11 6	7 49	20 10	8 9	20 8	18·2
S.	29	3 53	20 6	4 14	20 4	1 50	11 5	2 12	11 3	8 30	20 5	8 52	20 1	19·2
S.	30	4 37	20 2	5 0	19 11	2 34	11 1	2 57	10 11	9 15	19 8	9 39	19 3	20·2

Half mean spring range.   10ft. 4in.   5ft. 9in.   10ft. 5in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	3 57	Sub.	9	1 38	Sub.	17	0 25	Add.	25	2 5	Add.
2	3 39		10	1 21		18	0 39		26	2 15	
3	3 21		11	1 5		19	0 53		27	2 25	
4	3 3		12	0 49		20	1 6		28	2 35	
5	2 46		13	0 34		21	1 18		29	2 43	
6	2 28		14	0 18		22	1 31		30	2 52	
7	2 11		15	0 3		23	1 43				
8	1 54		16	0 11	Add.	24	1 54				

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for London 0 m.   Harwich *subtract* 5 m.   Hull *add* 1 m.

APRIL, 1899.

Week Day	Month Day	Moon's Transit	Sunderland (North dock). Approximate {Rise 6 5, Fall 6 25} Morning Time H.M.	Morning Height F.I.	Afternoon Time H.M.	Afternoon Height F.I.	North Shields (Low lighthouse). Approximate {Rise 5 40, Fall 6 15} Morning Time H.M.	Morning Height F.I.	Afternoon Time H.M.	Afternoon Height F.I.	Leith (East pier). Approximate {Rise 6 0, Fall 6 15} Morning Time H.M.	Morning Height F.I.	Afternoon Time H.M.	Afternoon Height F.I.
S.	1	4m 0	6 16	13 4	6 39	12 11	6 19	13 6	6 42	13 2	5 14	15 2	5 37	14 9
S.	2	4 59	7 4	12 6	7 31	12 1	7 7	12 10	7 34	12 5	6 2	14 3	6 30	13 10
M.	3	5 58	8 2	11 9	8 37	11 5	8 7	11 11	8 45	11 6	7 2	13 5	7 39	13 0
Tu.	4	6 55	9 17	11 2	10 2	11 1	9 28	11 4	10 14	11 1· 4	8 21	12 9	9 7	12 8
W.	5	7 51	10 47	11 2	11 27	11 6	10 59	11 6	11 40	11 10	9 52	12 9	10 33	13 1
Th.	6	8 44	—	—	0 3	11 11	—	—	0 16	12 3	11 10	13 6	11 43	14 0
F.	7	9 35	0 36	12 6	1 4	13 0	0 49	12 9	1 16	13 2	—	—	0 10	14 7
S.	8	10 25	1 31	13 6	1 57	13 11	1 40	13 7	2 2	14 0	0 34	15 2	0 57	15 8
S.	9	11 15	2 21	14 3	2 43	14 7	2 24	14 5	2 45	14 9	1 19	16 2	1 41	16 7
M.	10	on 6	3 4	14 9	3 24	14 11	3 5	15 0	3 25	15 2	2 2	16 10	2 22	17 0
Tu.	11	0 58	3 44	15 0	4 4	15 0	3 45	15 3	4 5	15 2	2 42	17 1	3 1	16 11
W.	12	1 51	4 23	14 11	4 42	14 9	4 25	15 0	4 44	14 9	3 20	16 9	3 39	16 6
Th.	13	2 44	5 0	14 5	5 19	14 0	5 3	14 5	5 23	14 1	3 58	16 2	4 17	15 9
F.	14	3 37	5 39	13 6	5 59	13 1	5 43	13 8	6 3	13 4	4 37	15 4	4 57	14 11
S.	15	4 29	6 20	12 8	6 42	12 2	6 23	12 11	6 44	12 6	5 18	14 6	5 40	14 0
S.	16	5 18	7 5	11 9	7 29	11 4	7 6	12 1	7 31	11 7	6 3	13 6	6 27	13 0
M.	17	6 5	7 55	11 0	8 24	10 8	8 0	11 2	8 31	10 10	6 54	12 7	7 25	12 2
Tu.	18	6 50	8 56	10 6	9 33	10 4	9 6	10 7	9 45	10 6	7 59	11 11	8 37	11 10
W.	19	7 33	10 12	10 3	10 49	10 4	10 25	10 7	11 2	10 8	9 17	11 9	9 55	11 11
Th.	20	8 15	11 23	10 7	11 54	10 11	11 36	10 11	—	—	10 29	12 2	11 1	12 5
F.	21	8 57	—	—	0 22	11 3	0 8	11 3	0 36	11 7	11 29	12 10	11 54	13 2
S.	22	9 40	0 48	11 8	1 11	12 1	1 0	11 11	1 22	12 3	—	—	0 16	13 7
S.	23	10 24	1 32	12 6	1 52	12 10	1 41	12 7	1 59	12 11	0 35	14 0	0 53	14 6
M.	24	11 11	2 12	13 2	2 32	13 5	2 17	13 4	2 34	13 8	1 11	14 11	1 29	15 4
Tu.	25	m.	2 50	13 9	3 7	13 11	2 51	13 11	3 8	14 2	1 47	15 8	2 5	15 11
W.	26	0 2	3 24	14 1	3 42	14 3	3 25	14 4	3 43	14 6	2 23	16 2	2 40	16 3
Th.	27	0 56	4 0	14 5	4 19	14 6	4 1	14 7	4 20	14 7	2 58	16 4	3 17	16 3
F.	28	1 53	4 39	14 5	4 59	14 3	4 40	14 5	5 1	14 3	3 36	16 2	3 56	15 11
S.	29	2 53	5 20	14 0	5 42	13 8	5 23	14 0	5 46	13 10	4 18	15 8	4 41	15 6
S.	30	3 53	6 5	13 4	6 31	13 0	6 10	13 7	6 35	13 4	5 5	15 3	5 30	14 11

Half mean spring range	Sunderland 7ft. 2in.	North Shields 7ft. 4in.	Leith 8ft. 2in.

Phases of the moon.

	D.	H.	M.	
Last Quarter	3	11	56	Morning
New	10	6	21	Morning
First Quarter	17	10	43	Afternoon
Full	25	7	22	Afternoon
In Perigee	6	1		Afternoon
In Apogee	18	2		Afternoon

Moon's declination at noon.

M.D.	° '	M.D.	° '	M.D.	° '	M.D.	° '
1	24 S.11	9	8 N.19	17	19 N.48	25	16 S. 1
2	23 45	10	13 28	18	16 33	26	19 46
3	21 50	11	17 48	19	12 37	27	22 29
4	18 34	12	21 7	20	8 11	28	23 53
5	14 10	13	23 13	21	3 23	29	23 47
6	8 56	14	24 5	22	1 S.37	30	22 10
7	3 13	15	23 44	23	6 41		
8	2 N.39	16	22 15	24	11 34		

APRIL, 1899.

Approximate —
THURSO (near Scrabster pier): RISE 6 30, FALL 6 0
GREENOCK (East dock): RISE 6 30, FALL 6 0
LIVERPOOL (George pier): RISE 5 35, FALL 5 50

Week Day	Month Day	Thurso Morn. Time (H.M.)	Height (F.I.)	Thurso Aft. Time (H.M.)	Height (F.I.)	Greenock Morn. Time (H.M.)	Height (F.I.)	Greenock Aft. Time (H.M.)	Height (F.I.)	Liverpool Morn. Time (H.M.)	Height (F.I.)	Liverpool Aft. Time (H.M.)	Height (F.I.)	D.
S.	1	11 29	11 7	11 55	11 1	2 45	9 5	3 5	9 3	1 55	25 1	2 16	24 0	20·7
S.	2	—	—	0 23	10 8	3 27	9 1	3 51	8 11	2 38	23 10	3 2	22 5	21·7
M.	3	0 54	10 3	1 30	9 11	4 19	8 9	4 51	8 8	3 31	22 10	4 5	20 11	☾
Tu.	4	2 12	9 8	2 59	9 7	5 28	8 6	6 9	8 4	4 45	21 8	5 31	20 2	23·7
W.	5	3 49	9 8	4 33	9 11	6 53	8 3	7 36	8 5	6 20	21 7	7 6	21 3	24·7
Th.	6	5 12	10 3	5 45	10 9	8 17	8 7	8 53	8 10	7 45	22 11	8 20	22 10	25·7
F.	7	6 12	11 4	6 35	12 0	9 24	9 1	9 51	9 4	8 49	24 10	9 14	24 10	26·7
S.	8	6 55	12 6	7 14	13 0	10 16	9 6	10 40	9 8	9 37	26 11	9 59	26 0	27·7
S.	9	7 33	13 6	7 52	13 10	11 4	9	11 27	9 10	10 20	28 2	10 41	27 5	28·7
M.	10	8 11	14 0	8 30	14 0	11 50	9 11	—	—	11 2	28	11 23	27 8	●
Tu.	11	8 49	13 11	9 8	13 9	0 11	10 0	0 32	10 0	11 43	28 5	—	—	1·2
W.	12	9 28	13 6	9 48	13 2	0 53	9 11	1 13	9 10	0 3	27 10	0 23	27 10	2·2
Th.	13	10 8	12	10 28	12 3	1 32	9 9	1 51	9 8	0 43	26 11	1 2	26 3	3·2
F.	14	10 49	11 10	11 10	11 4	2 10	9 6	2 29	9 4	1 21	25 7	1 40	24 9	4·2
S.	15	11 32	10 9	11 55	10 3	2 48	9 2	3 7	8 11	1 59	24 2	2 18	22 11	5·2
S.	16	—	—	0 19	9 10	3 27	8 9	3 48	8 7	2 38	22 10	2 59	21 5	6·2
M.	17	0 46	9 5	1 16	9 1	4 12	8 5	4 38	8 3	3 23	21 5	3 52	19 10	☽
Tu.	18	1 50	8 11	2 29	8 9	5 8	8 1	5 42	8 0	4 24	20 0	5 1	19 2	8·2
W.	19	3 11	8 8	3 52	8 9	6 19	7 11	6 56	7 10	5 43	19 4	6 25	19 6	9·2
Th.	20	4 29	8 11	5 2	9 1	7 32	7 11	8 6	8 1	7 2	20 3	7 35	20 5	10·2
F.	21	5 31	9 5	5 56	9 10	8 37	8 3	9 5	8 6	8 5	21 6	8 32	21 9	11·2
S.	22	6 18	10 4	6 36	10 10	9 30	8 8	9 52	8 10	8 55	22 11	9 15	23	12·2
S.	23	6 52	11 4	7 8	11 9	10 12	9 0	10 32	9 2	9 33	24 7	9 51	24 8	13·2
M.	24	7 24	12 2	7 39	12 7	10 52	9 3	11 12	9 4	10 9	25 7	10 27	25 10	14·2
Tu.	25	7 55	12 11	8 11	13 2	11 31	9 5	11 50	9 6	10 45	26 3	11 3	26 7	○
W.	26	8 28	13 3	8 46	13 4	—	—	0 9	9 7	11 21	26 8	11 40	27 2	16·2
Th.	27	9 5	13 3	9 25	13 2	0 29	9 8	0 49	9 9	—	—	noon. 26	10	17·2
F.	28	9 46	12 11	10 8	12 8	1 10	9 9	1 31	9 8	0 20	27 3	0 41	26 5	18·2
S.	29	10 31	12 5	10 55	12 1	1 52	9 8	2 13	9 7	1 2	26 8	1 23	25 4	19·2
S.	30	11 21	11 9	11 49	11 4	2 35	9 6	2 58	9 4	1 45	25 11	2 8	24 2	20·2

Half mean spring range — Thurso 6ft. 7in. — Greenock 4ft. 10in. — Liverpool 13ft. 9in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	3 57	Sub.	9	1 38	Sub.	17	0 25	Add.	25	2 5	Add.
2	3 39		10	1 21		18	0 39		26	2 15	
3	3 21		11	1 5		19	0 53		27	2 25	
4	3 3		12	0 49		20	1 6		28	2 35	
5	2 46		13	0 34		21	1 18		29	2 43	
6	2 28		14	0 18		22	1 31		30	2 52	
7	2 11		15	0 3		23	1 43				
8	1 54		16	0 11	Add.	24	1 54				

The times of high water are given for Mean time at place; if Greenwich or Railway time be required, —for
THURSO add 14 m. | GREENOCK add 19 m. | LIVERPOOL add 12 m.

APRIL, 1899.

WEEK DAY	MONTH DAY	MOON'S TRANSIT (H. M.)	PEMBROKE (H.M. Dockyard) APPROXIMATE { RISE 6 10, FALL 6 20 }				PORTISHEAD (Dock cntr.) APPROXIMATE { RISE 5 10, FALL 6 40 }				HOLYHEAD (Pier) APPROXIMATE { RISE 6 20, FALL 6 0 }			
			MORNING Time (H. M.)	Height (F. L.)	AFTERNOON Time (H. M.)	Height (F. L.)	MORNING Time (H. M.)	Height (F. L.)	AFTERNOON Time (H. M.)	Height (F. L.)	MORNING Time (H. M.)	Height (F. L.)	AFTERNOON Time (H. M.)	Height (F. L.)
S.	1	4m 0	9 8	20 7	9 29	19 11	10 0	38 9	10 21	37 8	0 48	15 0	1 11	14 7
S.	2	4 59	9 51	19 4	10 16	18 8	10 43	36 7	11 8	35 3	1 36	14 2	2 3	13 9
M.	3	5 58	10 45	18 1	11 17	17 5	11 36	33 11	—	—	2 35	13 3	3 12	13 0
Tu.	4	6 55	11 53	17 3	—	—	0 9	32 10	0 50	32 2	3 54	12 9	4 40	12 8
W.	5	7 51	0 35	17 4	1 20	17 8	1 35	32 5	2 21	33 3	5 25	12 10	6 7	13 2
Th.	6	8 44	2 5	18 3	2 45	19 1	3 5	34 6	3 47	36 2	6 44	13 7	7 16	14 1
F.	7	9 35	3 19	20 0	3 49	20 11	4 23	37 9	4 53	39 4	7 44	14 7	8 8	14 11
S.	8	10 25	4 17	21 7	4 44	22 3	5 21	40 7	5 47	41 8	8 32	15 6	8 54	15 11
S.	9	11 15	5 9	22 10	5 32	23 2	6 10	42 7	6 33	43 4	9 15	16 3	9 35	16 6
M.	10	0a 6	5 54	23 4	6 15	23 5	6 55	43 8	7 15	43 10	9 55	16 7	10 15	16 7
Tu.	11	0 58	6 36	23 4	6 56	23 3	7 35	43 9	7 55	43 4	10 34	16 6	10 52	16 5
W.	12	1 51	7 15	23 0	7 33	22 6	8 14	42 9	8 33	41 11	11 11	16 3	11 28	15 11
Th.	13	2 44	7 52	22 0	8 11	21	8 51	41 0	9 9	40	11 48	15 7	—	—
F.	14	3 37	8 30	20 10	8 49	20 2	9 26	39 1	9 44	38 0	0 8	15 3	0 30	14 10
S.	15	4 29	9 8	19 6	9 28	18 9	10 2	36 9	10 20	35 6	0 52	14 4	1 14	13 10
S.	16	5 18	9 48	18 1	10 9	17 6	10 39	34 3	10 59	33 0	1 36	13 5	2 0	13 6
M.	17	6 5	10 32	16 5	10 58	16 4	11 22	31 8	11 49	30 11	2 27	12 7	2 57	12 3
Tu.	18	6 50	11 28	16 0	—	—	—	—	0 22	30 2	3 31	12 0	4 10	11 10
W.	19	7 33	0 2	15 11	0 38	15 11	1 0	29 10	1 39	30 0	4 50	11 11	5 28	12 0
Th.	20	8 15	1 16	16 2	1 54	16 7	2 17	30 7	2 53	31 5	6 3	12 3	6 35	12 7
F.	21	8 57	2 29	17 2	2 59	17 10	3 28	32 8	4 13	33 10	7 3	12 11	7 28	13 3
S.	22	9 40	3 25	18 6	3 49	19 3	4 30	35 1	4 54	36 4	7 51	13 8	8 11	14 1
S.	23	10 24	4 12	19 10	4 34	20 5	5 16	37 5	5 37	38 5	8 29	14 5	8 47	14 9
M.	24	11 11	4 55	20 11	5 15	21 5	5 57	39 4	6 17	40 2	9 4	15 1	9 21	15 4
Tu.	25	m.	5 35	21 10	5 54	22 2	6 36	40 9	6 54	41 5	9 38	15 7	9 55	15 9
W.	26	0 2	6 13	22 6	6 32	22 6	7 13	41 11	7 32	42 0	10 13	15 11	10 31	16 0
Th.	27	0 56	6 51	22 6	7 11	22 5	7 51	42 1	8 11	41 9	10 49	16 0	11 7	15 11
F.	28	1 53	7 31	21 3	7 52	22 0	8 31	41 4	8 51	40 11	11 26	15 9	11 48	15 7
S.	29	2 53	8 14	21 8	8 37	21 3	9 11	40 6	9 32	39 11	—	—	0 12	15 4
S.	30	3 53	9 0	20 9	9 24	20 3	9 53	39 2	10 16	38 3	0 37	15 1	1 3	14 9

Half mean spring range.		
11 ft. 3 in.	21 ft. 0 in.	8 ft. 0 in.

Phases of the moon.

	D.	H.	M.	
Last Quarter -	3	11	56	Morning.
New - - - -	10	6	21	Morning.
First Quarter -	17	10	43	Afternoon.
Full - - -	25	7	22	Afternoon.
In Perigee -	6	1		Afternoon.
In Apogee -	18	2		Afternoon.

Moon's declination at noon.

M.D.	o '	M.D.	o '	M.D.	o '	M.D.	o '
1	24 S.11	9	8 N.19	17	19 N.48	25	16 S. 1
2	23 45	10	13 28	18	16 33	26	19 46
3	21 50	11	17 48	19	12 37	27	22 29
4	18 34	12	21 7	20	8 11	28	23 53
5	14 10	13	23 13	21	3 23	29	23 47
6	8 56	14	24 5	22	1 S.37	30	22 10
7	3 13	15	23 44	23	6 41		
8	2 N.39	16	22 15	24	11 34		

The times of high water are given for Mean time at place : if Greenwich or Railway time be required,—for PEMBROKE add 20 m. | PORTISHEAD add 11 m. | HOLYHEAD add 18 m.

APRIL, 1899.

WEEK DAY	MONTH DAY	KINGSTOWN (Watering pier) Morning Time H. M.	Height F. I.	Afternoon Time H. M.	Height F. I.	BELFAST (New dock) Morning Time H. M.	Height F. I.	Afternoon Time H. M.	Height F. I.	LONDONDERRY (Ship bridge) Morning Time H. M.	Height F. I.	Afternoon Time H. M.	Height F. I.	☾'s AGE AT NOON D.
S.	1	1 49	10 3	2 12	10 0	1 25	9 2	1 50	9 0	10 51	6 8	11 18	6 5	20·7
S.	2	2 36	9 9	3 2	9 6	2 17	8 10	2 46	8 7	11 50	6 1	—	—	21·7
M.	3	3 33	9 4	4 9	9 1	3 17	8 5	3 52	8 4	0 29	5 10	1 14	5 8	☾
Tu.	4	4 50	8 11	5 33	8 10	4 32	8 3	5 14	8 2	2 3	5 7	2 51	5 8	23·7
W.	5	6 15	9 0	6 54	9 3	5 57	8 2	6 38	8 3	3 34	5 11	4 11	6 3	24·7
Th.	6	7 31	9 6	8 5	9 9	7 17	8 4	7 51	8 6	4 42	6 7	5 9	6 10	25·7
F.	7	8 36	10 1	9 4	10 4	8 19	8 9	8 43	9 1	5 32	7 1	5 55	7 4	26·7
S.	8	9 30	10 8	9 54	10 11	9 7	9 3	9 30	9 5	6 18	7 6	6 40	7 9	27·7
S.	9	10 14	11 1	10 34	11 1	9 51	9 7	10 11	9 8	7 2	7 11	7 24	8 0	28·7
M.	10	10 53	11 4	11 12	11 5	10 31	9 9	10 51	9 9	7 45	8 1	8 5	8 2	●
Tu.	11	11 32	11 4	11 52	11 3	11 10	9 8	11 29	9 7	8 24	8 1	8 42	8 0	1·2
W.	12	—		0 12	11 1	11 48	9 6	—	—	9 0	7 10	9 17	7 7	2·2
Th.	13	0 32	10 11	0 52	10 8	0 7	9 5	0 27	9 4	9 35	7 4	9 53	7 1	3·2
F.	14	1 12	10 5	1 32	10 2	0 48	9 2	1 9	9 0	10 11	6 10	10 31	6 7	4·2
S.	15	1 53	9 10	2 14	9 7	1 31	8 10	1 54	8 8	10 53	6 3	11 18	5 11	5·2
S.	16	2 36	9 4	2 59	9 1	2 18	8 6	2 43	8 4	11 48	5 8	—	—	6·2
M.	17	3 25	8 11	3 56	8 8	3 10	8 2	3 39	8 0	0 23	5 5	1 0	5 3	☽
Tu.	18	4 30	8 6	5 6	8 5	4 11	7 11	4 47	7 10	1 40	5 2	2 22	5 2	8·2
W.	19	5 43	8 5	6 18	8 6	5 24	7 9	6 0	7 9	3 2	5 3	3 37	5 6	9·2
Th.	20	6 52	8 8	7 22	8 10	6 34	7 10	7 7	7 11	4 7	5 9	4 34	5 11	10·2
F.	21	7 50	9 1	8 17	9 4	7 37	8 0	8 3	8 2	4 58	6 1	5 19	6 4	11·2
S.	22	8 42	9 7	9 5	9 10	8 25	8 5	8 44	8 7	5 37	6 6	5 55	6 9	12·2
S.	23	9 26	10 0	9 45	10 2	9 3	8 10	9 21	9 0	6 13	6 11	6 31	7 1	13·2
M.	24	10 3	10 4	10 20	10 6	9 39	9 2	9 57	9 3	6 49	7 3	7 7	7 5	14·2
Tu.	25	10 36	10 8	10 53	10 10	10 14	9 4	10 31	9 5	7 25	7 6	7 43	7 7	○
W.	26	11 10	10 11	11 28	11 0	10 49	9 6	11 11	7 9	8 1	7 8	8 19	7 9	16·2
Th.	27	11 48	10 11	—	—	11 25	9 5	11 44	9 5	8 38	7 9	8 57	7 8	17·2
F.	28	0 9	10 10	0 30	10 9	—	—	0 5	9 4	9 16	7 6	9 35	7 4	18·2
S.	29	0 52	10 8	1 15	10 6	0 28	9 4	0 51	9 3	9 55	7 2	10 17	7 0	19·2
S.	30	1 39	10 4	2 4	10 1	1 15	9 2	1 42	9 0	10 42	6 9	11 12	6 6	20·2

Half mean spring range: Kingstown 5ft 6in. Belfast 4ft 9in. Londonderry 3ft 10in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	3 57	Sub.	9	1 38	Sub.	17	0 25	Add.	25	2 5	Add.
2	3 39		10	1 21		18	0 39		26	2 15	
3	3 21		11	1 5		19	0 53		27	2 25	
4	3 3		12	0 49		20	1 6		28	2 35	
5	2 46		13	0 34		21	1 18		29	2 43	
6	2 28		14	0 18		22	1 31		30	2 52	
7	2 11		15	0 3		23	1 43				
8	1 54		16	0 11	Add.	24	1 54				

The times of high water are given for Mean time at place; if Dublin or Railway time be required,—for KINGSTOWN *subtract* 1 m. for Dublin time. | BELFAST *subtract* 2 m. | LONDONDERRY *add* 4 m.

APRIL, 1899.

WEEK DAY.	MONTH DAY.	MOON'S TRANSIT.	SLIGO BAY (*Mullaghmore*). Approximate {RISE 6 10 / FALL 6 20}				GALWAY (*Nimmo pier*). Approximate {RISE 6 30 / FALL 6 0}				QUEENSTOWN (*Scott's wharf*). Approximate {RISE 6 5 / FALL 6 25}			
			MORNING.		AFTERNOON.		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.	
		H. M.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.
S.	1	4m 0	8 12	9 9	8 37	9 4	7 36	13 4	8 1	12 9	7 58	10 9	8 19	10 5
S.	2	4 59	9 6	9 1	9 40	8 10	8 28	12 3	8 58	11 9	8 43	10 1	9 9	9 9
M.	3	5 58	10 19	8 7	11 2	8 5	9 32	11 3	10 11	11 0	9 38	9 6	10 12	9 3
Tu.	4	6 55	11 47	8 5	—	—	10 55	10 11	11 41	11 1	10 54	9 2	11 38	9 3
W.	5	7 51	0 31	8 6	1 12	8 9	—	—	0 24	11 5	—	—	0 22	9 5
Th.	6	8 44	1 50	9 1	2 24	9 6	1 2	11 11	1 34	12 6	1 3	9 9	1 41	10 1
F.	7	9 35	2 52	9 11	3 14	10 4	2 1	13 1	2 27	13 8	2 15	10 6	2 43	10 11
S.	8	10 25	3 35	10 8	3 56	11 0	2 52	14 1	3 15	14 6	3 10	11 3	3 35	11 8
S.	9	11 15	4 16	11 4	4 37	11 6	3 36	14 11	3 57	15 3	3 58	11 11	4 20	12 1
M.	10	oa 6	4 58	11 8	5 19	11 9	4 18	15 5	4 38	15 6	4 42	12 2	5 3	12 3
Tu.	11	0 58	5 40	11 8	6 0	11 7	4 58	15 6	5 18	15 4	5 24	12 2	5 45	12 1
W.	12	1 51	6 19	11 5	6 38	11 1	5 38	15 2	5 58	14 10	6 5	12 0	6 24	11 9
Th.	13	2 44	6 57	10 9	7 16	10 5	6 17	14 5	6 37	14 0	6 43	11 6	7 2	11 3
F.	14	3 37	7 35	10 0	7 55	9 7	6 57	13 6	7 18	13 0	7 21	10 11	7 40	10 7
S.	15	4 29	8 15	9 2	8 37	8 9	7 39	12 5	8 1	11 10	8 0	10 3	8 20	9 10
S.	16	5 18	9 3	8 5	9 33	8 2	8 24	11 4	8 50	10 9	8 40	9 6	9 1	9 2
M.	17	6 5	10 6	7 11	10 41	7 10	9 18	10 4	9 49	10 1	9 25	8 11	9 53	8 9
Tu.	18	6 50	11 19	7 9	11 57	7 9	10 26	9 11	11 6	9 11	10 25	8 7	11 4	8 6
W.	19	7 33	—	—	0 34	7 10	11 45	10 1	—	—	11 42	8 7	—	—
Th.	20	8 15	1 8	8 0	1 40	8 3	0 20	10 4	0 52	10 8	0 18	8 9	0 52	8 11
F.	21	8 57	2 9	8 6	2 35	8 10	1 21	11 1	1 46	11 6	1 25	9 2	1 55	9 6
S.	22	9 40	2 56	9 2	3 15	9 6	2 8	12 0	2 28	12 5	2 19	10 2	2 44	10 1
S.	23	10 24	3 32	9 10	3 49	10 1	2 48	12 10	3 7	13 2	3 5	10 4	3 25	10 8
M.	24	11 11	4 6	10 5	4 23	10 8	3 25	13 7	3 43	13 11	3 45	10 11	4 5	11 2
Tu.	25	m.	4 41	10 11	4 59	11 1	4 1	14 2	4 19	14 5	4 24	11 5	4 42	11 6
W.	26	0 2	5 18	11 2	5 37	11 3	4 37	14 8	4 56	14 9	5 1	11 8	5 21	11 9
Th.	27	0 56	5 56	11 3	6 15	11 2	5 15	14 10	5 35	14 9	5 41	11 9	6 2	11 9
F.	28	1 53	6 35	11 0	6 57	10 9	5 56	14 7	6 18	14 5	6 23	11 8	6 44	11 6
S.	29	2 53	7 19	10 6	7 42	10 2	6 41	14 2	7 4	13 10	7 6	11 4	7 28	11 1
S.	30	3 53	8 6	9 10	8 32	9 6	7 28	13 6	7 55	13 1	7 51	10 10	8 14	10 7

Half mean spring range.		
5ft. 7in.	7ft. 5in.	5ft. 10in.

Phases of the moon.

	D.	H.	M.	
Last Quarter	3	11	56	Morning.
New	10	6	21	Morning.
First Quarter	17	10	43	Afternoon.
Full	25	7	22	Afternoon.
In Perigee	6	1		Afternoon.
In Apogee	18	2		Afternoon.

Moon's declination at noon.

M.D.	°	′	M.D.	°	′	M.D.	°	′	M.D.	°	′
1	24 S.	11	9	8 N.	19	17	19 N.	48	25	16 S.	1
2	23	45	10	13	28	18	16	33	26	19	46
3	21	50	11	17	48	19	12	37	27	22	29
4	18	34	12	21	7	20	8	11	28	23	53
5	14	10	13	23	13	21	3	23	29	23	47
6	8	56	14	24	5	22	1 S.	37	30	22	10
7	3	13	15	23	44	23	6	41			
8	2 N.	39	16	22	15	24	11	34			

The times of high water are given for Mean time at place; if Dublin or Railway time be required,—for SLIGO BAY *add* 9 m. | GALWAY *add* 11 m. | QUEENSTOWN *add* 6 m.

APRIL, 1899.

WATERFORD (*Duncannon fort*).
Approximate - { Rise 6 5 / Fall 6 20 }

WEEK DAY	MONTH DAY	MORNING Time H. M.	Height F. I.	AFTERNOON Time H. M.	Height F. I.	MORNING Time H. M.	Height F. I.	AFTERNOON Time H. M.	Height F. I.	MORNING Time H. M.	Height F. I.	AFTERNOON Time H. M.	Height F. I.	☾'S AGE AT NOON D.
S.	1	8 17	11 9	8 38	11 5									20·7
S.	2	9 0	11 1	9 24	10 10									21·7
M.	3	9 54	10 6	10 33	10 2									☾
Tu.	4	11 15	10 0	11 56	10 0									23·7
W.	5	—	—	0 35	10 2									24·7
Th.	6	1 13	10 5	1 50	10 10									25·7
F.	7	2 25	11 3	2 57	11 8									26·7
S.	8	3 26	12 0	3 54	12 4									27·7
S.	9	4 19	12 7	4 43	12 9									28·7
M.	10	5 5	12 10	5 26	12 10									●
Tu.	11	5 46	12 10	6 6	12 9									1·2
W.	12	6 26	12 8	6 46	12 6									2·2
Th.	13	7 5	12 3	7 24	12 0									3·2
F.	14	7 42	11 9	8 0	11 6									4·2
S.	15	8 18	11 2	8 36	10 10									5·2
S.	16	8 55	10 6	9 16	10 3									6·2
M.	17	9 41	9 11	10 12	9 8									☽
Tu.	18	10 48	9 5	11 24	9 4									8·2
W.	19	—	—	noon.	9 3									9·2
Th.	20	0 33	9 5	1 4	9 8									10·2
F.	21	1 34	9 11	2 4	10 3									11·2
S.	22	2 32	10 7	2 57	10 11									12·2
S.	23	3 21	11 2	3 43	11 5									13·2
M.	24	4 5	11 8	4 26	11 11									14·2
Tu.	25	4 46	12 1	5 5	12 3									○
W.	26	5 24	12 4	5 43	12 5									16·2
Th.	27	6 2	12 6	6 22	12 5									17·2
F.	28	6 43	12 4	7 4	12 3									18·2
S.	29	7 26	12 2	7 48	12 0									19·2
S.	30	8 10	11 10	8 33	11 7									20·2

Half mean spring range } 6ft. 2in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	3 57	Sub.	9	1 38	Sub.	17	0 25	Add.	25	2 5	Add.
2	3 39		10	1 21		18	0 39		26	2 15	
3	3 21		11	1 5		19	0 53		27	2 25	
4	3 3		12	0 49		20	1 6		28	2 35	
5	2 46		13	0 34		21	1 18		29	2 43	
6	2 28		14	0 18		22	1 31		30	2 52	
7	2 11		15	0 3		23	1 43				
8	1 54		16	0 11	Add.	24	1 54				

* The times of high water are given for Mean time at place; if Dublin or Railway time be required,—for WATERFORD add 3 m.

MAY, 1899.

WEEK DAY	MONTH DAY	MOON'S TRANSIT H. M.	BREST (Entr. of Dockyard basin). APPROXIMATE { RISE 6 10 / FALL 6 20 } MORNING Time H.M.	Height F.I.	AFTERNOON Time H.M.	Height F.I.	DEVONPORT (H.M. Dockyard). High Water. MORNING Time H.M.	Height F.I.	AFTERNOON Time H.M.	Height F.I.	APPROXIMATE { RISE 0 0 / FALL 6 10 } Low Water. MORNING Time H.M.	Height F.I.	AFTERNOON Time H.M.	Height F.I.
M.	1	4m51	7 27	16 2	7 57	15 7	9 6	13 9	9 31	14 2	2 56	1 4	3 19	2 6
Tu.	2	5 47	8 28	15 1	9 3	14 10	10 1	13 0	10 35	13 6	3 44	2 3	4 12	3 6
W.	3	6 40	9 41	14 8	10 21	14 10	11 12	12 6	11 52	13 4	4 46	3 2	5 26	4 4
Th.	4	7 30	11 1	15 0	11 38	15 4	—		0 34	12 7	6 18	3 6	6 49	4 2
F.	5	8 19	—	—	0 11	15 10	1 14	13 8	1 52	13 2	7 29	3 0	8 7	3 3
S.	6	9 8	0 41	16 4	1 9	16 10	2 27	14 3	2 57	14 1	8 42	2 0	9 14	2 2
S.	7	9 57	1 35	17 4	1 59	17 10	3 25	14 11	3 52	14 9	9 42	1 3	10 8	1 3
M.	8	10 48	2 22	18 3	2 45	18 6	4 16	15 2	4 39	15 2	10 31	0 8	10 53	0 8
Tu.	9	11 40	3 7	18 9	3 28	18 10	5 1	15 4	5 22	15 5	11 15	0 4	11 37	0 3
W.	10	0a33	3 48	18 9	4 8	18 7	5 43	15 4	6 3	15 5	11 58	0 2	—	
Th.	11	1 26	4 28	18 4	4 47	18 1	6 23	15 2	6 42	15 4	0 18	0 1	0 37	0 3
F.	12	2 19	5 7	17 9	5 24	17 5	6 59	14 9	7 15	14 11	0 56	0 3	1 14	0 4
S.	13	3 10	5 43	17 1	6 2	16 8	7 32	14 4	7 49	14 5	1 31	0 9	1 48	1 8
S.	14	3 58	6 21	16 3	6 41	15 9	8 6	13 5	8 23	13 11	2 4	1 4	2 21	2 6
M.	15	4 44	7 3	15 3	7 25	14 9	8 39	12 8	8 58	13 2	2 37	2 2	2 53	3 6
Tu.	16	5 28	7 49	14 3	8 15	13 10	9 19	12 1	9 41	12 6	3 10	3 1	3 29	4 4
W.	17	6 10	8 42	13 6	9 10	13 5	10 5	11 5	10 34	12 1	3 50	4 0	4 16	5 3
Th.	18	6 51	9 41	13 5	10 14	13 6	11 5	11 2	11 34	11 11	4 48	4 7	5 21	5 3
F.	19	7 33	10 48	13 8	11 20	13 11	—		0 12	11 6	5 55	4 10	6 29	5 3
S.	20	8 16	11 51	14 3	—		0 48	12 4	1 23	12 3	7 3	4 5	7 37	4 4
S.	21	9 2	0 19	14 8	0 45	15 2	1 56	13 0	2 26	13 1	8 10	3 4	8 42	3 3
M.	22	9 50	1 10	15 8	1 34	16 3	2 54	13 7	3 21	13 9	9 11	2 7	9 38	2 2
Tu.	23	10 43	1 56	16 10	2 18	17 4	3 46	14 2	4 10	14 5	10 0	1 11	10 25	1 6
W.	24	11 40	2 40	17 10	3 2	18 3	4 33	14 8	4 55	15 0	10 47	1 1	11 9	0 9
Th.	25	m.	3 24	18 7	3 46	18 10	5 17	15 1	5 39	15 3	11 31	0 6	11 53	0 1
F.	26	0 40	4 8	18 11	4 30	19 0	6 1	15 3	6 23	15 9	—		0 15	0 2
S.	27	1 42	4 52	19 0	5 15	18 11	6 45	15 4	7 8	15 10	0 38	*0 3	1 1	0 3
S.	28	2 43	5 39	18 8	6 4	18 5	7 31	15 2	7 54	15 8	1 24	*0 4	1 47	0 4
M.	29	3 41	6 30	18 1	6 57	17 7	8 17	14 9	8 41	15 4	2 10	0 1	2 33	1 2
Tu.	30	4 36	7 25	17 1	7 54	16 6	9 6	14 2	9 33	14 9	2 56	0 8	3 20	2 0
W.	31	5 28	8 23	16 1	8 52	15 8	10 1	13 6	10 29	14 0	3 44	1 8	4 10	3 0

Half mean spring range }	9ft. 6in.		7ft. 9in.

Phases of the moon.				Moon's declination at noon.								
	D.	H. M.		M.D.	o '	M.D.	o '	M.D.	o '	M.D.	o '
Last Quarter -	2	5 47	Afternoon	1	19 S. 10	9	20 N. 1	17	9 N. 33	25	23 S. 31
New - - -	9	5 39	Afternoon	2	15 2	10	22 31	18	4 55	26	23 54
First Quarter -	17	5 13	Afternoon	3	10 4	11	23 48	19	0 2	27	22 42
Full - - -	25	5 49	Morning	4	4 35	12	23 51	20	4 S. 57	28	19 59
Last Quarter -	31	10 55	Afternoon	5	1 N. 6	13	22 43	21	9 52	29	16 1
				6	6 41	14	20 33	22	14 28	30	11 8
In Perigee - -	1	9	Afternoon	7	11 52	15	17 32	23	18 30	31	5 42
In Apogee - -	16	9	Morning	8	16 24	16	13 48	24	21 37		
In Perigee - -	28	7	Morning								

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for BREST aid 18 m. | DEVONPORT add 17 m.
* Below zero, or datum to which soundings on charts are reduced.

MAY, 1899.

Week Day	Month Day	PORTSMOUTH (H.M. Dockyard) High Water Morning Time	Height	Afternoon Time	Height	Low Water Morning Time	Height	Afternoon Time	Height	DOVER (North pier) Morning Time	Height	Afternoon Time	Height	☾'s Age at Noon
		Approximate ‑ { Rise 7 20 / Fall 5 10								Approximate ‑ { Rise 5 0 / Fall 7 30				
M.	1	2 58	12 4	3 25	12 0	7 54	1 10	8 24	2 3	2 40	17 2	3 6	16 9	21·2
Tu.	2	3 54	11 9	4 25	11 6	8 59	2 8	9 37	3 0	3 35	16 4	4 5	15 10	☾
W.	3	4 58	11 4	5 34	11 3	10 18	3 3	11 0	3 3	4 36	15 6	5 8	15 3	23·2
Th.	4	6 11	11 2	6 49	11 3	11 42	3 1	—	—	5 41	15 3	6 16	15 5	24·2
F.	5	7 25	11 6	7 59	11 10	0 22	2 1	0 57	2 6	6 51	15 10	7 25	16 3	25·2
S.	6	8 31	12 1	9 1	12 4	1 25	2 1	1 51	1 8	7 56	16 8	8 24	17 1	26·2
S.	7	9 29	12 8	9 54	12 11	2 16	1 3	2 40	0 11	8 51	17 5	9 17	17 9	27·2
M.	8	10 17	13 1	10 40	13 2	3 2	0 7	3 24	0 5	9 42	18 0	10 7	18 2	28·2
Tu.	9	11 3	13 3	11 24	13 4	3 46	0 4	4 8	0 3	10 31	18 4	10 53	18 5	●
W.	10	11 44	13 3	—	—	4 29	0 2	4 48	0 2	11 15	18 4	11 37	18 3	0·8
Th.	11	0 4	13 2	0 24	13 1	5 7	0 3	5 26	0 5	11 59	18 1	—	—	1·8
F.	12	0 44	12 11	1 4	12 9	5 45	0 7	6 4	0 9	0 20	17 11	0 41	17 9	2·8
S.	13	1 24	12 6	1 43	12 4	6 23	1 0	6 41	1 3	1 2	17 6	1 23	17 3	3·8
S.	14	2 2	12 2	2 22	12 0	6 59	1 7	7 18	2 0	1 43	17 0	2 3	16 8	4·8
M.	15	2 43	11 9	3 4	11 6	7 38	2 4	8 0	2 8	2 24	16 3	2 45	15 11	5·8
Tu.	16	3 26	11 3	3 48	11 0	8 25	3 0	8 52	3 4	3 7	15 6	3 30	15 2	6·8
W.	17	4 12	10 10	4 37	10 8	9 22	3 8	9 54	3 10	3 53	14 10	4 16	14 6	☽
Th.	18	5 4	10 7	5 34	10 6	10 27	3 11	11 1	3 11	4 41	14 4	5 8	14 3	8·8
F.	19	6 5	10 6	6 37	10 6	11 36	3 10	—	—	5 37	14 3	6 6	14 4	9·8
S.	20	7 8	10 8	7 38	10 11	0 10	3 8	0 41	3 5	6 35	14 7	7 4	14 11	10·8
S.	21	8 7	11 2	8 35	11 6	1 9	3 1	1 33	2 8	7 33	15 2	8 0	15 9	11·8
M.	22	9 1	11 9	9 26	12 1	1 55	2 3	2 17	1 11	8 25	16 2	8 49	16 7	12·8
Tu.	23	9 50	12 4	10 13	12 7	2 38	1 7	2 59	1 2	9 13	17 0	9 37	17 4	13·8
W.	24	10 35	12 10	10 57	13 0	3 20	0 11	3 41	0 8	10 1	17 6	10 25	18 0	14·8
Th.	25	11 19	13 2	11 41	13 4	4 2	0 6	4 23	0 4	10 49	18 2	11 13	18 4	○
F.	26	—	—	0 4	13 5	4 45	0 2	5 7	0 1	11 37	18 6	—	—	16·8
S.	27	0 28	13 5	0 52	13 4	5 29	0 1	5 51	0 1	0 1	18 7	0 26	18 8	17·8
S.	28	1 16	13 3	1 41	13 2	6 14	0 2	6 38	0 4	0 52	18 7	1 18	18 6	18·8
M.	29	2 6	13 1	2 31	13 0	7 2	0 8	7 27	1 0	1 45	18 4	2 12	18 1	19·8
Tu.	30	2 57	12 9	3 24	12 6	7 53	1 4	8 21	1 8	2 39	17 10	3 6	17 5	20·8
W.	31	3 52	12 3	4 20	12 0	8 53	2 1	9 26	2 5	3 33	17 0	4 0	16 8	☾

Half mean spring range } Portsmouth 6ft. 9in.   Dover 9ft. 4in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	3 0	Add.	9	3 41	Add.	17	3 47	Add.	25	3 17	Add.
2	3 7		10	3 44		18	3 45		26	3 11	
3	3 14		11	3 46		19	3 43		27	3 5	
4	3 20		12	3 48		20	3 40		28	2 58	
5	3 25		13	3 49		21	3 36		29	2 51	
6	3 30		14	3 49		22	3 32		30	2 43	
7	3 34		15	3 49		23	3 28		31	2 34	
8	3 38		16	3 48		24	3 23				

The times of high water are given for Mean time at place; if Greenwich or Railway time be required.—for PORTSMOUTH *add* 4 m. | DOVER *subtract* 5 m.

MAY, 1899.

Week Day	Month Day	Moon's Transit H. M.	Sheerness (H.M. Dockyard) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	Chatham (H.M. Dockyard) High Water Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	Low Water Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.
M.	1	4m51	4 3	15 0	4 29	14 8	4 9	16 10	4 33	16 5	10 15	1 4	10 37	1 8
Tu.	2	5 47	4 57	14 4	5 28	14 1	5 0	16 0	5 30	15 7	11 3	2 0	11 32	2 5
W.	3	6 40	6 3	13 10	6 41	13 8	6 5	15 4	6 44	15 3	—	—	0 6	2 9
Th.	4	7 30	7 21	13 7	8 2	13 9	7 24	15 2	8 5	15 2	0 47	2 9	1 31	2 6
F.	5	8 19	8 41	14 0	9 16	14 3	8 45	15 3	9 22	15 9	2 16	2 2	3 0	1 10
S.	6	9 8	9 48	14 7	10 17	14 11	9 56	16 3	10 26	16 7	3 37	1 6	4 9	1 2
S.	7	9 57	10 43	15 2	11 8	15 5	10 52	16 11	11 16	17 3	4 38	0 11	5 6	0 8
M.	8	10 48	11 32	15 8	11 55	15 10	11 39	17 6	—		5 33	0 6	5 58	0 4
Tu.	9	11 40			0 18	15 11	0 2	17 9	0 24	17 11	6 21	0 4	6 44	0 4
W.	10	0n33	0 40	16 0	1 0	16 0	0 46	18 0	1 7	18 1	7 7	0 5	7 29	0 5
Th.	11	1 26	1 20	16 0	1 40	15 10	1 27	18 0	1 46	17 10	7 50	0 6	8 10	0 7
F.	12	2 19	1 59	15 8	2 18	15 6	2 5	17 7	2 24	17 4	8 28	0 9	8 45	1 0
S.	13	3 10	2 36	15 4	2 54	15 1	2 42	17 1	3 0	16 9	9 1	1 3	9 17	1 1
S.	14	3 58	3 12	14 10	3 31	14 7	3 19	16 6	3 38	16 3	9 33	1 10	9 49	2 0
M.	15	4 44	3 51	14 4	4 12	14 0	3 57	16 0	4 17	15 8	10 5	2 3	10 22	2 6
Tu.	16	5 28	4 34	13 9	4 57	13 6	4 38	15 4	5 0	15 0	10 41	2 9	11 2	3 0
W.	17	6 10	5 21	13 3	5 48	13 0	5 23	14 8	5 49	14 5	11 25	3 5	11 50	3 9
Th.	18	6 51	6 17	12 11	6 49	12 10	6 20	14 4	6 53	14 3			0 21	3 10
F.	19	7 33	7 22	12 10	7 56	12 11	7 26	14 3	7 59	14 3	0 57	3 8	1 34	3 5
S.	20	8 16	8 28	13 1	8 59	13 4	8 32	14 4	9 5	14 8	2 11	3 1	2 47	2 10
S.	21	9 2	9 28	13 8	9 56	13 11	9 36	15 0	10 4	15 5	3 20	2 6	3 50	2 3
M.	22	9 50	10 21	14 2	10 44	14 6	10 30	15 10	10 53	16 2	4 17	2 0	4 42	1 9
Tu.	23	10 43	11 7	14 10	11 29	15	11 15	16 6	11 37	16 10	5 6	1 6	5 30	1 3
W.	24	11 40	11 51	15 4	—		11 58	17 1	—		5 54	1 0	6 17	0 10
Th.	25	m.	0 13	15 7	0 35	15 10	0 19	17 5	0 40	17 8	6 40	0 9	7 2	0 8
F.	26	0 40	0 57	15 11	1 19	16 0	1 2	17 10	1 24	18 0	7 24	0 7	7 46	0 5
S.	27	1 42	1 40	16 1	2 2	16 0	1 46	18 1	2 8	18 1	8 8	0 5	8 30	0 4
S.	28	2 43	2 24	16 0	2 46	15 11	2 30	18 0	2 52	17 10	8 51	0 5	9 11	0 6
M.	29	3 41	3 9	15 10	3 34	15 8	3 15	17 8	3 40	17 6	9 31	0 8	9 52	0 10
Tu.	30	4 36	4 0	15 5	4 27	15 2	4 6	17 3	4 32	17 0	10 14	0 11	10 37	1 1
W.	31	5 28	4 55	14 11	5 24	14 8	4 59	16 8	5 27	16 4	11 2	1 4	11 29	1 9

Half mean spring range } 8ft. 0in.   9ft. 1in.

Phases of the moon.				*Moon's declination at noon.*											
	D.	H.	M.		M.D.	o	′	M.D.	o	′	M.D.	o	′	M.D.	o	′
Last Quarter -	2	5	47	Afternoon	1	19 S.10		9	20 N. 1		17	9 N.33		25	23 S.31
New - - -	9	5	39	Afternoon	2	15	2	10	22	31	18	4	55	26	23	5+
First Quarter -	17	5	13	Afternoon	3	10	4	11	23	48	19	0	2	27	22	42
Full - - -	25	5	49	Morning	4	4	35	12	23	51	20	4 S.57		28	19	59
Last Quarter -	31	10	55	Afternoon	5	1 N. 6		13	22	43	21	9	52	29	16	1
					6	6	41	14	20	33	22	14	28	30	11	8
In Perigee - -	1	9		Afternoon	7	11	52	15	17	32	23	18	30	31	5	42
In Apogee - -	16	9		Morning	8	16	24	16	13	48	24	21	37			
In Perigee - -	28	7		Morning												

MAY, 1899.

Approximate — LONDON (London bridge): RISE 5 30, FALL 7 0
Approximate — HARWICH (Angel quay): RISE 6 25, FALL 0 0
Approximate — HULL (Victoria dock): RISE 5 40, FALL 6 30

Week Day	Month Day	London Morn. Time (H. M.)	Ht. (F. I.)	London Aft. Time (H. M.)	Ht. (F. I.)	Harwich Morn. Time (H. M.)	Ht. (F. I.)	Harwich Aft. Time (H. M.)	Ht. (F. I.)	Hull Morn. Time (H. M.)	Ht. (F. I.)	Hull Aft. Time (H. M.)	Ht. (F. I.)	☾'s age at noon
M.	1	5 23	19 6	5 48	19 1	3 21	10 9	3 46	10 7	10 5	18 9	10 34	18 4	21·2
Tu.	2	6 16	18 8	6 47	18 3	4 12	10 5	4 41	10 3	11 7	17 11	11 45	17 6	(
W.	3	7 21	17 11	7 58	17 9	5 14	10 1	5 49	10 0	—	—	0 25	17 3	23·2
Th.	4	8 38	17 10	9 18	18 0	6 27	10 0	7 7	10 1	1 4	17 1	1 40	17 2	24·2
F.	5	9 55	18 3	10 29	18 6	7 47	10 3	8 23	10 5	2 14	17 6	2 46	18 0	25·2
S.	6	11 2	18 9	11 32	19 1	8 55	10 7	9 25	10 9	3 16	18 6	3 45	19 0	26·2
S.	7	—	—	0 1	19 6	9 53	11 0	10 19	11 2	4 12	19 5	4 37	19 10	27·2
M.	8	0 28	19 11	0 52	20 2	10 43	11 4	11 6	11 5	5 0	20 2	5 23	20 5	28·2
Tu.	9	1 15	20 3	1 38	20 4	11 30	11 6	11 52	11 7	5 46	20 6	6 9	20 7	29·2
W.	10	2 0	20 5	2 21	20 6	—	—	0 13	11 7	6 31	20 8	6 51	20 7	0·8 ●
Th.	11	2 40	20 6	2 59	20 5	0 33	11 6	0 53	11 5	7 11	20 5	7 31	20 3	1·8
F.	12	3 18	20 3	3 37	20 1	1 13	11 4	1 33	11 2	7 51	20 0	8 10	19 9	2·8
S.	13	3 56	19 10	4 15	19 8	1 53	11 0	2 12	10 10	8 29	19 6	8 48	19 1	3·8
S.	14	4 34	19 5	4 53	19 2	2 31	10 8	2 49	10 6	9 7	18 8	9 27	18 3	4·8
M.	15	5 12	18 10	5 32	18 5	3 9	10 4	3 29	10 2	9 48	17 10	10 10	17 5	5·8
Tu.	16	5 54	18 1	6 17	17 9	3 50	10 0	4 12	9 11	10 34	17 0	11 0	16 8	6·8
W.	17	6 41	17 4	7 6	17 1	4 35	9 10	5 0	9 8	11 30	16 4	—	—	)
Th.	18	7 33	16 11	8 4	16 11	5 27	9 7	5 56	9 6	0 2	16 2	0 34	16 0	8·8
F.	19	8 37	17 0	9 10	17 2	6 28	9 7	7 2	9 8	1 4	16 0	1 34	16 1	9·8
S.	20	9 43	17 4	10 14	17 6	7 36	9 9	8 7	9 11	2 3	16 3	2 30	16 7	10·8
S.	21	10 43	17 9	11 10	18 0	8 35	10 1	9 2	10 3	2 57	17 1	3 24	17 7	11·8
M.	22	11 36	18 4	—	—	9 28	10 5	9 53	10 8	3 50	18 1	4 14	18 6	12·8
Tu.	23	0 1	18 4	0 26	19 2	10 17	10 10	10 40	11 0	4 37	18 11	4 58	19 4	13·8
W.	24	0 50	19 6	1 12	19 9	11 3	11 1	11 25	11 4	5 19	19 8	5 41	20 0	14·8
Th.	25	1 34	20 0	1 55	20 2	11 47	11 5	—	—	6 3	20 3	6 25	20 5	○
F.	26	2 16	20 4	2 37	20 6	0 9	11 6	0 30	11 7	6 48	20 7	7 11	20 9	16·8
S.	27	2 58	20 8	3 20	20 8	0 52	11 7	1 15	11 6	7 34	20 10	7 57	20 9	17·8
S.	28	3 43	20 7	4 6	20 7	1 38	11 5	2 1	11 4	8 20	20 8	8 44	20 6	18·8
M.	29	4 30	20 6	4 55	20 4	2 26	11 3	2 52	11 2	9 10	20 2	9 36	19 10	19·8
Tu.	30	5 20	20 1	5 46	19 8	3 18	11 0	3 44	10 10	10 3	19 6	10 31	19 1	20·8
W.	31	6 13	19 3	6 43	18 11	4 11	10 8	4 39	10 6	11 1	18 8	11 34	18 4	(

Half mean spring range: London 10ft. 4in. — Harwich 5ft. 9in. — Hull 10ft. 5in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	3 0	Add.	9	3 41	Add.	17	3 47	Add.	25	3 17	Add.
2	3 7		10	3 44		18	3 45		26	3 11	
3	3 14		11	3 46		19	3 43		27	3 5	
4	3 20		12	3 48		20	3 40		28	2 58	
5	3 25		13	3 49		21	3 36		29	2 51	
6	3 30		14	3 49		22	3 32		30	2 43	
7	3 34		15	3 49		23	3 28		31	2 34	
8	3 38		16	3 48		24	3 23				

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for LONDON 0 m. | HARWICH subtract 5 m. | HULL add 1 m.

MAY, 1899.

WEEK DAY	MONTH DAY	MOON'S TRANSIT H. M.	SUNDERLAND (North dock.) APPROXIMATE {RISE 6 5 / FALL 6 25} Morning Time H.M.	Height F.L.	Afternoon Time H.M.	Height F.L.	NORTH SHIELDS (Low lighthouse.) APPROXIMATE {RISE 5 40 / FALL 6 45} Morning Time H.M.	Height F.L.	Afternoon Time H.M.	Height F.L.	LEITH (East pier.) APPROXIMATE {RISE 6 0 / FALL 6 15} Morning Time H.M.	Height F.L.	Afternoon Time H.M.	Height F.L.
M.	1	4m51	6 59	12 9	7 29	12 5	7 2	13 0	7 32	12 8	5 58	14 6	6 28	14 1
Tu.	2	5 47	8 1	12 1	8 35	11 10	8 5	12 4	8 42	12 0	7 1	13 9	7 37	13 6
W.	3	6 40	9 12	11 8	9 50	11 7	9 22	11 10	10 3	11 10	8 17	13 4	8 57	13 3
Th.	4	7 30	10 30	11 8	11 7	11 10	10 42	12 0	11 19	12 3	9 37	13 4	10 13	13 6
F.	5	8 19	11 39	12 2	—	—	11 52	12 6	—	—	10 45	13 10	11 15	14 2
S.	6	9 8	0 8	12 6	0 36	12 10	0 22	12 9	0 48	13 0	11 42	14 5		
S.	7	9 57	1 3	13 2	1 29	13 6	1 13	13 3	1 37	13 7	0 7	14 9	0 31	15 2
M.	8	10 48	1 54	13 8	2 18	13 10	2 0	13 10	2 22	14 1	0 54	15 6	1 17	15 9
Tu.	9	11 40	2 42	14 0	3 4	14 1	2 43	14 3	3 4	14 4	1 40	15 11	2 2	16 1
W.	10	0a33	3 24	14 2	3 44	14 2	3 24	14 5	3 43	14 4	2 22	16 2	2 41	16 1
Th.	11	1 26	4 3	14 1	4 22	14 0	4 3	14 3	4 23	14 1	3 0	16 0	3 19	15 9
F.	12	2 19	4 40	13 9	4 59	13 6	4 43	13 10	5 3	13 6	3 38	15 6	3 57	15 2
S.	13	3 10	5 19	13 3	5 39	12 11	5 23	13 3	5 43	13 0	4 17	14 11	4 37	14 7
S.	14	3 58	5 59	12 8	6 20	12 3	6 3	12 9	6 23	12 6	4 57	14 4	5 18	14 1
M.	15	4 44	6 42	12 0	7 5	11 9	6 44	12 3	7 7	12 0	5 41	13 9	6 4	13 5
Tu.	16	5 28	7 29	11 6	7 54	11 3	7 31	11 8	7 58	11 4	6 28	13 1	6 54	12 9
W.	17	6 10	8 21	11 0	8 49	10 10	8 27	11 1	8 58	11 0	7 22	12 6	7 52	12 5
Th.	18	6 51	9 20	10 9	9 52	10 9	9 31	10 11	10 4	11 0	8 24	12 4	8 57	12 3
F.	19	7 33	10 25	10 10	10 56	10 11	10 37	11 1	11 8	11 3	9 30	12 4	10 1	12 6
S.	20	8 16	11 24	11 2	11 50	11 5	11 37	11 6	—	—	10 30	12 9	10 57	13 0
S.	21	9 2	—	—	0 15	11 9	0 4	11 9	0 29	12 0	11 22	13 3	11 46	13 7
M.	22	9 50	0 39	12 1	1 3	12 5	0 52	12 3	1 14	12 6	—	—	0 8	13 11
Tu.	23	10 43	1 27	12 9	1 51	13 1	1 36	12 10	1 57	13 2	0 30	14 4	0 52	14 9
W.	24	11 40	2 14	13 4	2 37	13 7	2 18	13 6	2 39	13 9	1 14	15 2	1 36	15 6
Th.	25	m.	2 59	13 9	3 20	13 11	2 59	14 0	3 20	14 2	1 58	15 9	2 19	16 0
F.	26	0 40	3 41	14 2	4 3	14 4	3 41	14 4	4 3	14 5	2 39	16 2	3 0	16 3
S.	27	1 42	4 25	14 5	4 47	14 4	4 26	14 6	4 49	14 5	3 22	16 3	3 44	16 1
S.	28	2 43	5 10	14 3	5 34	14 0	5 13	14 3	5 38	14 1	4 8	15 11	4 33	15 9
M.	29	3 41	6 0	13 9	6 28	13 6	6 4	13 11	6 31	13 9	4 59	15 7	5 26	15 5
Tu.	30	4 36	6 57	13 3	7 27	13 0	6 59	13 6	7 28	13 5	5 55	15 2	6 25	14 10
W.	31	5 28	7 57	12 9	8 27	12 6	8 0	12 11	8 33	12 7	6 57	14 6	7 29	14 2
Half mean spring range.			**7ft 2in.**				**7ft 4in.**				**8ft 2in.**			

Phases of the moon.

	D.	H.	M.	
Last Quarter -	2	5	47	Afternoon.
New - - -	9	5	39	Afternoon.
First Quarter -	17	5	13	Afternoon.
Full - - -	25	5	49	Morning.
Last Quarter -	31	10	55	Afternoon.
In Perigee - -	1	9		Afternoon.
In Apogee -	16	9		Morning.
In Perigee -	28	7		Morning.

Moon's declination at noon.

M.D.	° '	M.D.	° '	M.D.	° '	M.D.	° '
1	19 S.10	9	20 N. 1	17	9 N.33	25	23 S.31
2	15 2	10	22 31	18	4 55	26	23 54
3	10 4	11	23 48	19	0 2	27	22 42
4	4 35	12	23 51	20	4 S.57	28	19 59
5	1 N. 6	13	22 43	21	9 52	29	16 1
6	6 41	14	20 33	22	14 28	30	11 8
7	11 52	15	17 32	23	18 30	31	5 42
8	16 24	16	13 48	24	21 37		

The times of high water are given for Mean time at place; if Greenwich or Railway time be required, — for
SUNDERLAND *add* 5 m. | NORTH SHIELDS *add* 6 m. | LEITH *add* 13 m.

MAY, 1899.

Week Day	Month Day	THURSO (near Scrabster pier) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	GREENOCK (East dock) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	LIVERPOOL (George pier) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	D's Age at Noon
M.	1	— —		0 19	11 0	3 22	9 3	3 49	9 1	2 33	24 9	3 0	22 9	21·2
Tu.	2	0 51	10 8	1 27	10 5	+ 18	9 0	+ 49	8 10	3 29	23 6	+ 3	21 10	☾
W.	3	2 7	10 3	2 49	10 2	5 23	8 8	6 0	8 7	+ 41	22 7	5 21	21 5	23·2
Th.	4	3 31	10 3	4 10	10 4	6 37	8 6	7 14	8 7	6 2	22 6	6 42	22 2	24·2
F.	5	+ 46	10 6	5 17	10 9	7 50	8 9	8 23	8 11	7 19	23 9	7 51	23 1	25·2
S.	6	5 44	11 1	6 9	11 6	8 53	9 1	9 22	9 3	8 20	24 9	8 46	24 6	26·2
☉	7	6 32	11 11	6 52	12 4	9 49	9 4	10 14	9 5	9 10	25 8	9 33	25 7	27·2
M.	8	7 8	12 8	7 34	12 11	10 39	9 5	11 4	9 6	9 56	26 6	10 19	26 2	28·2
Tu.	9	7 50	13 1	8 8	13 2	11 28	9 6	11 51	9 7	10 42	26 7	11 3	26 5	●
W.	10	8 28	13 1	8 48	12 11	— —		0 12	9 7	11 23	26 7	11 43	26 5	0·8
Th.	11	9 8	12 9	9 28	12 6	0 33	9 7	0 53	9 6	— —		0 3	26 3	1·8
F.	12	9 48	12 2	10 8	11 10	1 12	9 5	1 31	9 4	0 23	26 2	0 42	25 5	2·8
S.	13	10 28	11 6	10 48	11 2	1 50	9 3	2 9	9 2	1 1	25 6	1 20	24 4	3·8
☉	14	11 9	10 10	11 32	10 6	2 28	9 1	2 47	9 0	1 39	24 7	1 58	23 0	4·8
M.	15	11 55	10 3	— —		3 6	8 10	3 27	8 9	2 17	23 5	2 38	21 11	5·8
Tu.	16	0 20	9 11	0 46	9 8	3 49	8 7	4 12	8 6	3 0	22 0	3 23	21 0	6·8
W.	17	1 13	9 5	1 43	9 4	4 36	8 5	5 2	8 4	3 49	21 1	+ 17	20 0	☽
Th.	18	2 15	9 3	2 50	9 3	5 30	8 3	6 0	8 2	+ 48	20 7	5 22	19 9	8·8
F.	19	3 26	9 3	4 0	9 4	6 32	8 2	7 4	8 2	5 57	20 5	6 31	20 6	9·8
S.	20	4 30	9 6	4 58	9 8	7 34	8 3	8 3	8 4	7 2	21 4	7 32	21 6	10·8
☉	21	5 24	9 11	5 48	10 3	8 31	8 6	8 57	8 8	8 0	22 5	8 25	22 7	11·8
M.	22	6 10	10 8	6 31	11 1	9 22	8 10	9 47	9 0	8 48	23 4	9 10	23 10	12·8
Tu.	23	6 50	11 7	7 9	12 0	10 11	9 1	10 35	9 2	9 31	24 6	9 52	25 3	13·8
W.	24	7 28	12 5	7 47	12 9	10 59	9 3	11 22	9 4	10 14	25 4	10 36	26 4	14·8
Th.	25	8 7	13 0	8 27	13 1	11 45	9 5	— —		10 58	26 1	11 20	26 11	○
F.	26	8 48	13 2	9 10	13 2	0 8	9 6	0 31	9 7	11 43	26 5	— —		16·8
S.	27	9 33	13 1	9 57	12 11	0 54	9 8	1 18	9 9	0 6	27 7	0 29	26 6	17·8
☉	28	10 23	12 6	10 50	12 6	1 42	9 9	2 6	9 9	0 52	27 6	1 16	25 9	18·8
M.	29	11 18	12 3	11 47	11 11	2 31	9 8	2 56	9 7	1 41	26 10	2 6	25 0	19·8
Tu.	30	— —		0 17	11 7	3 22	9 6	3 49	9 5	2 32	25 11	2 59	24 4	20·8
W.	31	0 48	11 4	1 20	11 1	+ 16	9 4	+ 43	9 2	3 27	24 11	3 56	23 1	☾

THURSO — Approximate { Rise 6 30, Fall 6 0 } H. M.
GREENOCK — Approximate { Rise 6 30, Fall 6 0 } H. M.
LIVERPOOL — Approximate { Rise 5 35, Fall 6 50 } H. M.

Half mean spring range } THURSO 6ft. 7in. GREENOCK 4ft. 10in. LIVERPOOL 13ft. 9in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	3 0	Add.	9	3 41	Add.	17	3 47	Add.	25	3 17	Add.
2	3 7		10	3 44		18	3 45		26	3 11	
3	3 14		11	3 46		19	3 43		27	3 5	
4	3 20		12	3 48		20	3 40		28	2 58	
5	3 25		13	3 49		21	3 36		29	2 51	
6	3 30		14	3 49		22	3 32		30	2 43	
7	3 34		15	3 49		23	3 28		31	2 34	
8	3 38		16	3 48		24	3 23				

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for THURSO add 14 m. | GREENOCK add 19 m. | LIVERPOOL add 12 m.

MAY, 1899.

WEEK DAY	MONTH DAY	MOON'S TRANSIT	PEMBROKE (H.M. Dockyard). APPROXIMATE - RISE 6 10 / FALL 6 20				PORTISHEAD (Dock entr.). APPROXIMATE - RISE 5 40 / FALL 0 40				HOLYHEAD (Pier). APPROXIMATE - RISE 6 20 / FALL 6 0			
			MORNING.		AFTERNOON.		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.	
		H. M.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.
M.	1	4 m 51	9 49	19 9	10 16	19 3	10 41	37 4	11 6	36 4	1 30	14 4	2 0	14 0
Tu.	2	5 47	10 44	18 9	11 14	18 4	11 33	35 2	—	—	2 32	13 9	3 8	13 5
W.	3	6 40	11 46	18 1	—		0 4	34 5	0 40	33 10	3 48	13 3	4 30	13 2
Th.	4	7 30	0 20	18 1	0 58	18 4	1 19	33 11	1 59	34 4	5 10	13 4	5 47	13 7
F.	5	8 19	1 37	18 8	2 14	19 2	2 37	35 1	3 14	36 3	6 19	13 10	6 49	14 1
S.	6	9 8	2 47	19 8	3 18	20 3	3 49	37 3	4 22	38 3	7 16	14 5	7 42	14 9
S.	7	9 57	3 47	20 10	4 14	21 3	4 53	39 3	5 20	40 0	8 7	15 1	8 30	15 4
M.	8	10 48	4 41	21 7	5 7	21 10	5 45	40 6	6 9	40 11	8 52	15 6	9 14	15 8
Tu.	9	11 40	5 32	22 0	5 55	22 1	6 32	41 2	6 54	41 5	9 35	15 9	9 55	15 10
W.	10	0 n 33	6 15	22 1	6 35	22 0	7 14	41 5	7 34	41 5	10 14	15 9	10 32	15 8
Th.	11	1 26	6 55	21 9	7 14	21 6	7 54	40 8	8 13	40 0	10 50	15 6	11 9	15 4
F.	12	2 19	7 32	21 2	7 51	20 10	8 32	39 4	8 50	38 9	11 28	15 1	11 48	14 10
S.	13	3 10	8 10	20 5	8 29	20 0	9 8	38 3	9 25	37 2	—		0 9	14 7
S.	14	3 58	8 48	19 6	9 8	19 1	9 43	36 11	10 1	36 1	0 30	14 3	0 52	13 11
M.	15	4 44	9 28	18 8	9 49	18 3	10 20	35 4	10 39	34 7	1 14	13 7	1 37	13 4
Tu.	16	5 28	10 10	17 10	10 31	17 5	10 59	33 8	11 20	32 8	2 1	13 1	2 26	12 10
W.	17	6 10	10 53	17 0	11 17	16 9	11 43	32 1	—		2 54	12 7	3 24	12 5
Th.	18	6 51	11 44	16 8	—		0 10	31 8	0 40	31 4	3 56	12 4	4 30	12 4
F.	19	7 33	0 14	16 9	0 45	16 10	1 12	31 5	1 45	31 8	5 4	12 5	5 36	12 7
S.	20	8 16	1 18	17 1	1 51	17 6	2 18	32 3	2 51	33 0	6 5	12 10	6 31	13 1
S.	21	9 2	2 22	17 11	2 51	18 6	3 23	34 0	3 53	35 0	6 56	13 4	7 20	13 8
M.	22	9 50	3 18	19 1	3 45	19 8	4 22	36 0	4 49	37 1	7 43	14 0	8 6	14 4
Tu.	23	10 43	4 11	20 3	4 36	20 8	5 15	38 1	5 40	38 11	8 27	14 8	8 47	15 0
W.	24	11 40	5 1	21 2	5 26	21 6	6 4	39 8	6 27	40 4	9 8	15 3	9 29	15 5
Th.	25	m.	5 50	21 10	6 13	22 1	6 50	40 11	7 13	41 6	9 50	15 7	10 11	15 9
F.	26	0 40	6 35	22 4	6 57	22 5	7 35	41 9	7 57	41 10	10 32	15 10	10 53	15 11
S.	27	1 42	7 19	22 5	7 42	22 3	8 19	41 9	8 41	41 6	11 15	15 11	11 38	15 10
S.	28	2 43	8 6	22 1	8 31	21 10	9 4	41 3	9 28	40 11	—		0 3	15 7
M.	29	3 41	8 56	21 6	9 22	21 1	9 52	40 5	10 16	39 9	0 31	15 5	0 59	15 2
Tu.	30	4 36	9 48	20 8	10 14	20 1	10 40	39 11	11 1	38 2	1 28	14 11	1 58	14 7
W.	31	5 28	10 40	19 10	11 6	19 4	11 30	37 2	11 55	36 3	2 28	14 4	3 1	14 1

Half mean spring range }	11ft. 3in.	21ft. 0in.	8ft. 0in.

Phases of the moon.			*Moon's declination at noon.*							
	D. H. M.		M.D.	° ′	M.D.	° ′	M.D.	° ′	M.D.	° ′
Last Quarter -	2 5 47	Afternoon.	1	19 S.10	9	20 N. 1	17	9 N.33	25	23 S.31
New - - - -	9 5 39	Afternoon.	2	15 2	10	22 31	18	4 55	26	23 54
First Quarter -	17 5 13	Afternoon.	3	10 4	11	23 48	19	0 2	27	22 42
Full - - - -	25 5 49	Morning.	4	4 35	12	23 51	20	4 S.57	28	19 59
Last Quarter -	31 10 55	Afternoon.	5	1 N. 6	13	22 43	21	9 52	29	16 1
			6	6 41	14	20 33	22	14 28	30	11 8
In Perigee - -	1 9	Afternoon.	7	11 52	15	17 32	23	18 30	31	5 42
In Apogee -	16 9	Morning.	8	16 24	16	13 48	24	21 37		
In Perigee - -	28 7	Morning.								

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for
PEMBROKE *add* 20 m.   PORTISHEAD *add* 11 m.   HOLYHEAD *add* 18 m.

MAY, 1899.

WEEK DAY	MONTH DAY	KINGSTOWN (Watering pier). Approximate { Rise 6 15 / Fall 6 0 }				BELFAST (New dock). Approximate { Rise 6 20 / Fall 6 0 }				LONDONDERRY (Ship bridge). Approximate { Rise 6 15 / Fall 6 15 }				D's AGE AT NOON
		MORNING		AFTERNOON		MORNING		AFTERNOON		MORNING		AFTERNOON		
		Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	D.
M.	1	2 31	9 11	3 0	9 9	2 11	8 10	2 42	8 9	11 47	6 3	—	—	21·2
Tu.	2	3 32	9 7	4 7	9 5	3 15	8 7	3 50	8 6	0 27	6 0	1 11	5 11	☾
W.	3	+ 45	9 3	5 22	9 2	+ 27	8 5	5 5	8 4	1 57	5 11	2 40	6 0	23·2
Th.	4	5 59	9 3	6 34	9 5	+ 42	8 4	6 17	8 4	3 18	6 2	3 52	6 5	24·2
F.	5	7 6	9 7	7 36	9 10	6 51	8 5	7 23	8 6	+ 20	6 8	4 44	6 10	25·2
S.	6	8 6	10 0	8 35	10 2	7 51	8 8	8 16	8 10	5 6	7 0	5 28	7 2	26·2
S.	7	9 3	10 4	9 28	10 6	8 41	9 0	9 +	9 2	5 51	7 4	6 14	7 5	27·2
M.	8	9 51	10 7	10 12	10 8	9 27	9 3	9 49	9 4	6 37	7 6	7 0	7 6	28·2 ●
Tu.	9	10 33	10 9	10 53	10 10	10 11	9 5	10 32	9 5	7 23	7 7	7 45	7 7	
W.	10	11 13	10 10	11 33	10 9	10 52	9 4	11 10	9 4	8 +	7 7	8 23	7 6	0·8
Th.	11	11 53	10 8	—	—	11 28	9 3	11 47	9 2	8 41	7 5	8 59	7 3	1·8
F.	12	0 12	10 6	0 31	10 4	—	—	0 7	9 1	9 16	7 1	9 34	6 11	2·8
S.	13	0 51	10 2	1 11	10 0	0 27	9 0	0 47	8 11	9 52	6 8	10 10	6 6	3·8
S.	14	1 31	9 10	1 52	9 7	1 8	8 10	1 31	8 9	10 30	6 4	10 53	6 1	4·8
M.	15	2 14	9 5	2 37	9 3	1 55	8 7	2 19	8 5	11 20	5 11	11 49	5 8	5·8
Tu.	16	3 0	9 2	3 25	9 0	2 43	8 4	3 8	8 3	—	—	0 21	5 6	6·8
W.	17	3 52	8 10	+ 22	8 9	3 36	8 2	+ 5	8 1	0 55	5 5	1 30	5 4	☽
Th.	18	+ 53	8 8	5 24	8 8	+ 35	8 0	5 5	8 0	2 6	5 5	2 42	5 6	8·8
F.	19	5 54	8 9	6 24	8 10	5 36	8 0	6 6	8 0	3 14	5 8	3 43	5 10	9·8
S.	20	6 52	9 0	7 18	9 2	6 36	8 1	7 5	8 2	+ 7	6 0	4 30	6 3	10·8
S.	21	7 +4	9 +	8 10	9 6	7 31	8 3	7 55	8 4	+ 51	6 5	5 10	6 7	11·8
M.	22	8 35	9 9	9 0	9 11	8 17	8 6	8 39	8 9	5 29	6 9	5 50	6 11	12·8
Tu.	23	9 25	10 1	9 47	10 3	9 1	8 11	9 23	9 1	6 11	7 0	6 33	7 2	13·8
W.	24	10 8	10 5	10 28	10 7	9 45	9 2	10 6	9 3	6 56	7 4	7 19	7 5	14·8
Th.	25	10 48	10 9	11 9	10 10	10 27	9 4	10 48	9 5	7 41	7 6	8 2	7 7	O
F.	26	11 31	10 11	11 54	10 11	11 9	9 5	11 30	9 5	8 23	7 8	8 44	7 8	16·8
S.	27	—	—	0 17	10 10	11 52	9 5	—	—	9 5	7 7	9 26	7 6	17·8
S.	28	0 41	10 9	1 7	10 8	0 16	9 4	0 42	9 4	9 49	7 4	10 13	7 2	18·8
M.	29	1 33	10 6	2 0	10 4	1 10	9 3	1 39	9 2	10 39	7 0	11 8	6 10	19·8
Tu.	30	2 29	10 2	2 58	10 1	2 9	9 1	2 40	9 0	11 42	6 8	—	—	20·8
W.	31	3 28	9 11	3 59	9 9	3 11	8 10	3 42	8 9	0 19	6 5	0 59	6 3	☾

Half mean spring range: Kingstown 5ft. 6in.   Belfast 4ft. 9in.   Londonderry 3ft. 10in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	3 0	Add.	9	3 41	Add.	17	3 47	Add.	25	3 17	Add.
2	3 7		10	3 44		18	3 45		26	3 11	
3	3 14		11	3 46		19	3 43		27	3 5	
4	3 20		12	3 48		20	3 40		28	2 58	
5	3 25		13	3 49		21	3 36		29	2 51	
6	3 30		14	3 49		22	3 32		30	2 43	
7	3 34		15	3 49		23	3 28		31	2 34	
8	3 38		16	3 48		24	3 23				

The times of high water are given for Mean time at place; if Dublin or Railway time be required,—for KINGSTOWN *subtract* 1 m. for Dublin time. | BELFAST *subtract* 2 m. | LONDONDERRY *add* 4 m.

D

MAY, 1899.

Week Day.	Month Day.	Moon's Transit. H. M.	SLIGO BAY (*Mullaghmore*). APPROXIMATE - { RISE 6 10 / FALL 6 20 } Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	GALWAY (*Nimmo pier*). APPROXIMATE - { RISE 6 30 / FALL 6 0 } Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	QUEENSTOWN (*Scott's wharf*). APPROXIMATE - { RISE 6 30 / FALL 6 25 } Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.
M.	1	4m51	9 3	9 3	9 38	9 1	8 25	12 7	8 57	12 2	8 39	10 4	9 6	10 1
Tu.	2	5 47	10 17	8 11	10 57	8 10	9 30	11 9	10 5	11 7	9 36	9 10	10 9	9 9
W.	3	6 40	11 37	8 10			10 45	11 6	11 25	11 8	10 45	9 8	11 22	9 9
Th.	4	7 30	0 14	8 11	0 50	9 1	—		0 3	11 11	—		noon.	9 9
F.	5	8 19	1 24	9 3	1 55	9 6	0 36	12 3	1 7	12 7	0 36	9 11	1 10	10 2
S.	6	9 8	2 23	9 9	2 48	10 0	1 34	12 11	2 0	13 3	1 43	10 5	2 14	10 8
S.	7	9 57	3 11	10 3	3 33	10 6	2 25	13 7	2 50	13 11	2 42	10 11	3 8	11 1
M.	8	10 48	3 54	10 9	4 16	10 11	3 13	14 1	3 36	14 3	3 33	11 3	3 57	11 5
Tu.	9	11 40	4 38	11 0	5 0	11 1	3 58	14 4	4 19	14 5	4 20	11 6	4 42	11 7
W.	10	0a33	5 21	11 1	5 40	11 0	4 39	14 6	4 59	14 5	5 3	11 7	5 24	11 6
Th.	11	1 26	5 58	10 10	6 17	10 8	5 19	14 3	5 39	14 0	5 45	11 5	6 5	11 3
F.	12	2 19	6 36	10 5	6 55	10 2	5 58	13 9	6 17	13 6	6 24	11 1	6 43	10 11
S.	13	3 10	7 14	9 10	7 33	9 6	6 36	13 2	6 56	12 10	7 2	10 8	7 21	10 6
S.	14	3 58	7 53	9 3	8 15	9 0	7 17	12 6	7 39	12 2	7 40	10 3	7 59	10 0
M.	15	4 44	8 38	8 9	9 3	8 6	8 2	11 10	8 25	11 5	8 18	9 9	8 39	9 6
Tu.	16	5 28	9 31	8 4	10 1	8 2	8 49	11 0	9 14	10 9	9 1	9 4	9 23	9 2
W.	17	6 10	10 33	8 1	11 6	8 1	9 43	10 7	10 14	10 6	9 47	9 0	10 14	8 11
Th.	18	6 51	11 38	8 2			10 46	10 6	11 19	10 7	10 45	8 11	11 17	9 0
F.	19	7 33	0 9	8 3	0 39	8 4	11 51	10 9			11 50	9 0		
S.	20	8 16	1 9	8 6	1 36	8 8	0 21	11 0	0 48	11 4	0 20	9 2	0 50	9 4
S.	21	9 2	2 3	8 11	2 27	9 2	1 14	11 8	1 38	12 0	1 19	9 6	1 47	9 9
M.	22	9 50	2 49	9 5	3 10	9 8	2 1	12 4	2 24	12 9	2 14	10 0	2 40	10 3
Tu.	23	10 43	3 30	10 0	3 50	10 3	2 47	13 1	3 9	13 5	3 5	10 7	3 29	10 10
W.	24	11 40	4 11	10 6	4 32	10 9	3 31	13 9	3 53	14 0	3 52	11 1	4 15	11 3
Th.	25	m.	4 54	10 11	5 16	11 1	4 15	14 3	4 36	14 6	4 38	11 5	5 1	11 7
F.	26	0 40	5 38	11 2	6 0	11 2	4 58	14 8	5 21	14 9	5 24	11 8	5 47	11 9
S.	27	1 42	6 23	11 1	6 47	10 11	5 44	14 9	6 8	14 8	6 10	11 9	6 34	11 8
S.	28	2 43	7 12	10 9	7 37	10 6	6 33	14 6	6 59	14 3	6 58	11 7	7 23	11 5
M.	29	3 41	8 3	10 1	8 30	10 0	7 26	14 0	7 54	13 9	7 48	11 3	8 13	11 1
Tu.	30	4 36	8 59	9 6	9 32	9 6	8 23	13 4	8 53	12 11	8 38	10 10	9 4	10 7
W.	31	5 28	10 6	9 4	10 41	9 3	9 23	12 6	9 53	12 3	9 30	10 4	9 56	10 2
Half mean spring range.			5ft. 7in.				7ft. 5in.				5ft. 10in.			

Phases of the moon.

	D.	H.	M.	
Last Quarter -	2	5	47	Afternoon.
New - - -	9	5	39	Afternoon.
First Quarter -	17	5	13	Afternoon.
Full - - -	25	5	49	Morning.
Last Quarter -	31	10	55	Afternoon.
In Perigee - -	1	9		Afternoon.
In Apogee -	16	9		Morning.
In Perigee -	28	7		Morning.

Moon's declination at noon.

M.D.	o	'	M.D.	o	'	M.D.	o	'	M.D.	o	'
1	19 S.10		9	20 N. 1		17	9 N.33		25	23 S.31	
2	15	2	10	22	31	18	4	55	26	23	54
3	10	4	11	23	48	19	0	2	27	22	42
4	4	35	12	23	51	20	4 S.57		28	19	59
5	1 N.6		13	22	43	21	9	52	29	16	1
6	6	41	14	20	33	22	14	28	30	11	8
7	11	52	15	17	32	23	18	30	31	5	42
8	16	24	16	13	48	24	21	37			

The times of high water are given for Mean time at place ; if Dublin or Railway time be required,—for SLIGO BAY *add 9* m. | GALWAY *add 11* m. | QUEENSTOWN *add 8* m.

MAY, 1899.

WATERFORD (*Duncannon fort*).

APPROXIMATE - { RISE 6 5 / FALL 6 20 (H. M.)

Week Day	Month Day	Morning Time H. M.	Morning Height F. L.	Afternoon Time H. M.	Afternoon Height F. L.	☾'s Age at Noon D.
M.	1	8 57	11 4	9 23	11 1	21·2
Tu.	2	9 53	10 10	10 29	10 8	☾
W.	3	11 6	10 6	11 41	10 5	23·2
Th.	4	—	—	0 15	10 6	24·2
F.	5	0 48	10 8	1 20	10 11	25·2
S.	6	1 52	11 2	2 24	11 5	26·2
S.	7	2 55	11 8	3 24	11 10	27·2
M.	8	3 51	12 0	4 17	12 2	28·2
Tu.	9	4 42	12 3	5 5	12 3	●
W.	10	5 25	12 2	5 45	12 1	0·8
Th.	11	6 5	12 0	6 25	11 11	1·8
F.	12	6 45	11 10	7 4	11 8	2·8
S.	13	7 23	11 6	7 41	11 4	3·8
S.	14	7 59	11 2	8 18	11 0	4·8
M.	15	8 37	10 9	8 56	10 7	5·8
Tu.	16	9 16	10 5	9 40	10 2	6·8
W.	17	10 6	10 0	10 36	9 10	☽
Th.	18	11 6	9 9	11 36	9 9	8·8
F.	19	—	—	0 5	9 9	9·8
S.	20	0 34	9 11	1 1	10 1	10·8
S.	21	1 28	10 3	1 56	10 6	11·8
M.	22	2 25	10 10	2 53	11 1	12·8
Tu.	23	3 20	11 4	3 46	11 7	13·8
W.	24	4 12	11 10	4 37	12 0	14·8
Th.	25	5 1	12 1	5 24	12 2	○
F.	26	5 46	12 3	6 8	12 4	16·8
S.	27	6 31	12 5	6 55	12 5	17·8
S.	28	7 19	12 4	7 43	12 3	18·8
M.	29	8 7	12 2	8 31	12 0	19·8
Tu.	30	8 56	11 10	9 21	11 7	20·8
W.	31	9 47	11 4	10 15	11 2	☾

Half mean spring range } 6ft. 2in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	3 0	Add.	9	3 41	Add.	17	3 47	Add.	25	3 17	Add.
2	3 7		10	3 44		18	3 45		26	3 11	
3	3 14		11	3 46		19	3 43		27	3 5	
4	3 20		12	3 48		20	3 40		28	2 58	
5	3 25		13	3 49		21	3 36		29	2 51	
6	3 30		14	3 49		22	3 32		30	2 43	
7	3 34		15	3 49		23	3 28		31	2 34	
8	3 38		16	3 48		24	3 23				

The times of high water are given for Mean time at place ; if Dublin or Railway time be required,—for WATERFORD *add* 3 m.

JUNE, 1899.

WEEK DAY.	MONTH DAY.	MOON'S TRANSIT.	BREST (Entr. of Dockyard basin). APPROXIMATE {RISE 6 10 / FALL 6 20}				DEVONPORT (H.M. Dockyard). APPROXIMATE {RISE 6 0 / FALL 6 10}							
			MORNING.		AFTERNOON.		High Water.				Low Water.			
							MORNING.		AFTERNOON.		MORNING.		AFTERNOON.	
		H. M.	Time H. M.	Height F. L.	Time H. M.	Height F. L.	Time H. M.	Height F. L.	Time H. M.	Height F. L.	Time H. M.	Height F. L.	Time H. M.	Height F. L.
Th.	1	6 17	9 22	15 4	9 54	15 3	10 58	13 0	11 30	13 5	4 39	2 7	5 12	3 8
F.	2	7 5	10 27	15 4	11 1	15 3	—		0 4	12 10	5 47	3 4	6 22	3 11
S.	3	7 54	11 36	15 4	—		0 39	13 5	1 15	13 2	6 55	3 4	7 29	3 6
S.	4	8 43	0 9	15 6	0 40	15 9	1 51	13 7	2 26	13 6	8 4	2 10	8 39	2 10
M.	5	9 33	1 10	16 1	1 38	16 5	2 56	13 10	3 24	13 11	9 12	2 4	9 41	2 2
Tu.	6	10 25	2 3	16 9	2 26	17 1	3 50	14 2	4 16	14 5	10 7	1 11	10 31	1 6
W.	7	11 18	2 49	17 4	3 11	17 7	4 40	14 4	5 3	14 10	10 54	1 4	11 17	0 11
Th.	8	on 11	3 32	17 8	3 53	17 7	5 25	14 7	5 46	15 0	11 40	1 1	—	
F.	9	1 2	4 13	17 6	4 33	17 5	6 5	14 6	6 24	15 1	0 11	0 6	0 20	0 11
S.	10	1 52	4 51	17 4	5 8	17 3	6 42	14 4	6 59	14 11	0 39	0 4	0 57	1 3
S.	11	2 39	5 25	17 1	5 43	16 11	7 16	14 0	7 32	14 8	1 14	0 9	1 31	1 8
M.	12	3 23	6 1	16 9	6 20	16 6	7 48	13 7	8 4	14 3	1 47	1 1	2 3	2 3
Tu.	13	4 6	6 39	16 2	6 59	15 10	8 20	13 1	8 37	13 8	2 19	1 8	2 35	2 11
W.	14	4 47	7 19	15 6	7 40	15 2	8 54	12 7	9 12	13 1	2 51	2 6	3 7	3 6
Th.	15	5 28	8 1	14 9	8 23	14 5	9 31	12 2	9 51	12 6	3 23	3 4	3 40	4 3
F.	16	6 10	8 47	14 2	9 13	14 0	10 14	11 11	10 39	12 2	4 0	4 0	4 24	4 9
S.	17	6 53	9 41	13 11	10 13	13 11	11 7	11 9	11 38	12 1	4 52	4 6	5 23	5 1
S.	18	7 39	10 46	14 0	11 19	14 2	—		0 13	12 0	5 56	4 9	6 30	4 9
M.	19	8 29	11 52	14 6	—		0 49	12 4	1 25	12 6	7 4	4 5	7 39	4 1
Tu.	20	9 24	0 24	14 10	0 55	15 4	2 0	12 9	2 3	13 0	8 15	3 9	8 50	3 3
W.	21	10 23	1 24	15 11	1 51	16 7	3 6	13 5	3 36	14 0	9 23	2 9	9 53	2 2
Th.	22	11 24	2 16	17 3	2 41	17 10	4 5	14 2	4 32	14 10	10 21	1 9	10 47	1 0
F.	23	m.	3 6	18 5	3 31	18 9	4 58	14 9	5 24	15 6	11 13	0 11	11 39	0
S.	24	0 27	3 56	19 1	4 21	19 4	5 49	15 2	6 14	16 0	—		0 5	0 4
S.	25	1 28	4 45	19 6	5 8	19 7	6 39	15 6	7 3	16 4	0 30	*0 7	0 54	0 1
M.	26	2 27	5 31	19 6	5 55	19 4	7 26	15 5	7 49	16 4	1 18	*0 8	1 42	0 2
Tu.	27	3 21	6 19	19 1	6 43	18 8	8 12	15 3	8 35	15 11	2 5	*0 7	2 28	0 6
W.	28	4 13	7 8	18 2	7 34	17 7	8 58	14 10	9 21	15 4	2 50	0 0	3 12	1 3
Th.	29	5 3	8 0	17 0	8 26	16 5	9 44	14 3	10 8	14 5	3 34	0 11	3 56	2 3
F.	30	5 52	8 52	15 10	9 20	15 4	10 32	13 6	10 57	13 7	4 18	2 0	4 42	3 0

Half mean spring range	9ft. 6in.		7ft. 9in.

Phases of the moon.				Moon's declination at noon.							
	D.	H. M.		M.D.	o '	M.D.	o '	M.D.	o '	M.D.	o '
New	8	6 20	Morning.	1	0 S. 3	9	23 N. 9	17	8 N. 10	25	17 S. 29
First Quarter	16	9 46	Morning.	2	5 N. 30	10	21 17	18	12 49	26	12 43
Full	23	2 20	Afternoon.	3	10 43	11	18 30	19	17 1	27	7 15
Last Quarter	30	4 45	Morning.	4	15 20	12	14 58	20	20 30	28	1 29
				5	19 8	13	10 52	21	22 55	29	4 N. 14
				6	21 55	14	6 21	22	23 57	30	9 36
In Apogee	13	3	Morning.	7	23 32	15	1 35	23	23 22		
In Perigee	25	5	Morning.	8	23 56	16	3 S. 18	24	21 9		

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for BREST add 18 m. | DEVONPORT add 17 m.
* Below zero, or datum to which soundings on charts are reduced.

JUNE, 1899.

Week day	Month day	PORTSMOUTH (H.M. Dockyard) High Water Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	Low Water Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	DOVER (North pier) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	☽'s age at noon D.
Th.	1	4 48	11 10	5 17	11 8	10 1	2 9	10 37	2 11	+ 27	16 3	4 54	15 11	22·8
F.	2	5 47	11 6	6 18	11 4	11 14	2 11	11 50	2 11	5 21	15 8	5 49	15 6	23·8
S.	3	6 50	11 4	7 23	11 6	—	—	0 24	2 9	6 18	15 7	6 49	15 9	24·8
Su.	4	7 57	11 8	8 30	11 10	0 56	2 6	1 25	2 3	7 22	16 0	7 55	16 3	25·8
M.	5	9 1	12 0	9 30	12 2	1 51	1 11	2 16	1 8	8 25	16 6	8 53	16 9	26·8
Tu.	6	9 57	12 4	10 22	12 6	2 41	1 5	3 5	1 2	9 20	16 11	9 46	17 1	27·8
W.	7	10 45	12 7	11 7	12 7	3 28	1 0	3 50	0 11	10 11	17 3	10 35	17 4	28·8
Th.	8	11 28	12 8	11 49	12 8	4 12	0 10	4 34	0 10	10 58	17 5	11 21	17 6	●
F.	9			0 10	12 8	4 54	0 10	5 13	0 10	11 43	17 5	—	—	1·2
S.	10	0 30	12 7	0 50	12 6	5 32	0 11	5 50	1 0	0 4	17 4	0 24	17 4	2·2
Su.	11	1 9	12 5	1 27	12 4	6 7	1 1	6 24	1 2	0 44	17 3	1 4	17 2	3·2
M.	12	1 45	12 3	2 3	12 2	6 41	1 4	6 59	1 7	1 23	17 1	1 42	17 0	4·2
Tu.	13	2 21	12 1	2 40	11 11	7 17	1 10	7 35	2 1	2 1	16 10	2 20	16 7	5·2
W.	14	2 59	11 9	3 18	11 7	7 54	2 4	8 15	2 6	2 40	16 4	3 0	16 2	6·2
Th.	15	3 38	11 6	3 58	11 4	8 38	2 9	9 3	3 1	3 20	15 11	3 40	15 8	7·2
F.	16	4 20	11 2	4 44	11 0	9 30	3 4	9 58	3 6	4 1	15 4	4 23	15 1	☽
S.	17	5 9	10 11	5 35	10 10	10 28	3 8	11 0	3 7	4 46	14 10	5 10	14 8	9·2
Su.	18	6 4	10 9	6 35	10 9	11 34	3 7			5 36	14 7	6 4	14 6	10·2
M.	19	7 7	10 10	7 40	11 1	0 9	3 6	0 42	3 3	6 34	14 9	7 6	15 1	11·2
Tu.	20	8 13	11 4	8 46	11 7	1 12	2 11	1 39	2 7	7 39	15 5	8 11	15 10	12·2
W.	21	9 16	11 10	9 44	12 3	2 4	2 2	2 29	1 9	8 41	16 3	9 9	16 9	13·2
Th.	22	10 11	12 7	10 37	12 10	2 54	1 4	3 19	0 11	9 37	17 3	10 5	17 8	14·2
F.	23	11 2	13 1	11 27	13 3	3 44	0 8	4 8	0 5	10 33	18 1	11 0	18 4	O
S.	24	11 52	13 5	—	—	4 32	0 3	4 56	0 0	11 25	18 7	11 51	18 10	16·2
Su.	25	0 17	13 7	0 42	13 8	5 20	*0 1	5 44	*0 2	—	—	0 17	19 0	17·2
M.	26	1 7	13 8	1 32	13 7	6 7	*0 2	6 30	*0 1	0 43	19 1	1 9	19 1	18·2
Tu.	27	1 57	13 6	2 22	13 5	6 54	0 1	7 18	0 5	1 35	19 0	2 1	18 10	19·2
W.	28	2 46	13 3	3 10	13 1	7 42	0 9	8 6	1 0	2 26	18 7	2 51	18 3	20·2
Th.	29	3 34	12 10	3 58	12 6	8 31	1 4	8 59	1 9	3 16	17 10	3 40	17 5	21·2
F.	30	4 23	13 3	4 49	11 11	9 30	2 3	10 3	2 8	4 4	16 11	4 28	16 5	☾

Approximate—Portsmouth { RISE 7 20 / FALL 5 10 }; Dover { RISE 5 0 / FALL 7 30 }

Half mean spring range	Portsmouth 6ft. 9in.	Dover 9ft. 4in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	2 26	Add	9	1 2	Add	17	0 38	Sub	25	2 20	Sub
2	2 16		10	0 50		18	0 50		26	2 33	
3	2 7		11	0 38		19	1 3		27	2 45	
4	1 57		12	0 26		20	1 16		28	2 58	
5	1 46		13	0 13		21	1 29		29	3 10	
6	1 36		14	0 1		22	1 42		30	3 22	
7	1 25		15	0 12	Sub	23	1 55				
8	1 13		16	0 25		24	2 8				

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for PORTSMOUTH add 4 m. | DOVER subtract 5 m.
* Below zero, or datum to which soundings on charts are reduced.

JUNE, 1899.

Week Day	Month Day	Moon's Transit H. M.	Sheerness Morning Time H. M.	Height F. I.	Sheerness Afternoon Time H. M.	Height F. I.	Chatham High Water Morning Time H. M.	Height F. I.	Chatham High Water Afternoon Time H. M.	Height F. I.	Chatham Low Water Morning Time H. M.	Height F. I.	Chatham Low Water Afternoon Time H. M.	Height F. I.
Th.	1	6 17	5 54	14 5	6 25	14 2	5 57	16 0	6 29	15 10	11 58	2 2	—	
F.	2	7 - 5	6 59	13 11	7 34	13 11	7 4	15 8	7 38	15 7	0 30	2 4	1 7	2 3
S.	3	7 54	8 9	14 0	8 42	14 1	8 12	15 6	8 46	15 7	1 47	2 1	2 24	1 10
S.	4	8 43	9 15	14 3	9 46	14 5	9 21	15 9	9 54	16 0	3 0	1 8	3 35	1 6
M.	5	9 33	10 15	14 7	10 44	14 9	10 25	16 3	10 53	16 5	4 8	1 4	4 38	1 3
Tu.	6	10 25	11 11	14 11	11 36	15	11 19	16 7	11 43	16 9	5 7	1 2	5 35	1 1
W.	7	11 18	11 59	15 1	—		—		0 6	16 11	6 1	1 1	6 25	1 2
Th.	8	0a 11	0 22	15 2	0 44	15 3	0 28	17 1	0 50	17 2	6 48	1 3	7 11	1 3
F.	9	1 2	1 5	15 4	1 25	15 3	1 11	17 3	1 32	17 2	7 33	1 4	7 55	1 4
S.	10	1 52	1 45	15 2	2 4	15 1	1 52	17 1	2 10	17 0	8 15	1 5	8 33	1 6
S.	11	2 39	2 22	15 0	2 39	15 0	2 27	16 10	2 44	16 8	8 50	1 7	9 5	1 8
M.	12	3 23	2 56	14 11	3 13	14 9	3 2	16 6	3 20	16 5	9 20	1 10	9 35	2 0
Tu.	13	4 6	3 31	14 7	3 50	14 5	3 38	16 4	3 56	16 2	9 50	2 1	10 5	2 2
W.	14	4 47	4 9	14 3	4 29	14 1	4 15	16 0	4 34	15 9	10 21	2 3	10 38	2 4
Th.	15	5 28	4 49	13 11	5 10	13 9	4 53	15 6	5 13	15 3	10 56	2 6	11 15	2 9
F.	16	6 10	5 32	13 7	5 56	13 5	5 35	15 0	5 59	14 10	11 35	3 1	11 59	3 4
S.	17	6 53	6 23	13 3	6 51	13 2	6 26	14 9	6 55	14 8	—		0 27	3 5
S.	18	7 39	7 21	13 3	7 53	13 3	7 26	14 8	7 58	14 7	0 58	3 4	1 33	3 1
M.	19	8 29	8 26	13 4	8 59	13 6	8 31	14 8	9 4	14 10	2 9	2 10	2 44	2 7
Tu.	20	9 24	9 31	13 9	10 1	14 0	9 37	15 2	10 10	15 6	3 19	2 4	3 52	2 0
W.	21	10 23	10 30	14 4	10 58	14 8	10 40	15 10	11 7	16 3	4 20	1 10	4 51	1 7
Th.	22	11 24	11 24	15 0	11 49	15 3	11 32	16 8	11 56	17 0	5 20	1 4	5 48	1 1
F.	23	m.	—		0 14	15 6	—		0 20	17 5	6 15	0 11	6 41	0 9
S.	24	0 27	0 39	15 9	1 4	16 0	0 45	17 9	1 10	18 0	7 7	0 7	7 33	0 5
S.	25	1 28	1 29	16 2	1 53	16 3	1 35	18 3	2 0	18 5	7 58	0 3	8 22	0 1
M.	26	2 27	2 16	16 4	2 39	16 4	2 23	18 5	2 45	18 4	8 44	0 0	9 5	0 0
Tu.	27	3 21	3 2	16 4	3 26	16 2	3 8	18 3	3 32	18 2	9 25	0 1	9 46	0 2
W.	28	4 13	3 50	16 0	4 14	15 9	3 57	18 0	4 21	17 9	10 7	0 4	10 28	0 6
Th.	29	5 3	4 39	15 6	5 5	15 3	4 45	17 6	5 9	17 1	10 49	0 8	11 12	0 11
F.	30	5 52	5 31	14 11	5 58	14 7	5 34	16 7	6 1	16	11 35	1 4	mid.	1 11

Half mean spring range }   8ft. 0in.   9ft. 1in.

Phases of the moon.

	D.	H.	M.	
New - - - -	8	6	20	Morning.
First Quarter	16	9	46	Morning.
Full - - -	23	2	20	Afternoon.
Last Quarter -	30	4	45	Morning.
In Apogee	13	3		Morning.
In Perigee	25	5		Morning.

Moon's declination at noon.

M.D.	o '	M.D.	o '	M.D.	o '	M.D.	o '
1	0 s. 3	9	23 N. 9	17	8 s.10	25	17 s.29
2	5 N.30	10	21 17	18	12 49	26	12 43
3	10 43	11	18 30	19	17 1	27	7 15
4	15 20	12	14 58	20	20 30	28	1 29
5	19 8	13	10 52	21	22 55	29	4 N.14
6	21 55	14	6 21	22	23 57	30	9 36
7	23 32	15	1 35	23	23 22		
8	23 56	16	3 s.18	24	21 9		

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for SHEERNESS subtract 8 m.   CHATHAM subtract 2 m.

JUNE, 1899.

Week Day	Month Day	LONDON (London bridge) Morning Time H.M.	Height F. I.	Afternoon Time H.M.	Height F. I.	HARWICH (Angel quay) Morning Time H.M.	Height F. I.	Afternoon Time H.M.	Height F. I.	HULL (Victoria dock) Morning Time H.M.	Height F. I.	Afternoon Time H.M.	Height F. I.	☾'s Age at Noon D.
		APPROXIMATE { RISE 5 30 / FALL 7 0				APPROXIMATE { RISE 6 25 / FALL 6 0				APPROXIMATE { RISE 5 40 / FALL 6 30				
Th.	1	7 14	18 6	7 45	18 4	5 8	10 5	5 37	10 4	—	—	0 9	18 0	22·8
F.	2	8 17	18 3	8 49	18 3	6 8	10 3	6 42	10 3	0 44	17 8	1 17	17 7	23·8
S.	3	9 22	18 4	9 55	18 5	7 16	10 3	7 49	10 4	1 46	17 6	2 15	17 5	24·8
S.	4	10 28	18 6	11 0	18 7	8 22	10 5	8 54	10 6	2 45	17 11	3 15	18 3	25·8
M.	5	11 30	18 9	mid.	18 11	9 24	10 7	9 53	10 9	3 44	18 7	4 13	18 10	26·8
Tu.	6	—	—	0 29	19 3	10 21	10 11	10 47	11 0	4 39	19 1	5 4	19 3	27·8
W.	7	0 55	19 5	1 18	19 6	11 11	11 1	11 35	11 1	5 28	19 5	5 51	19 6	28·8
Th.	8	1 41	19 7	2 4	19 8	11 57	11 3			6 13	19 7	6 35	19 7	●
F.	9	2 25	19 8	2 45	19 9	0 18	11 2	0 38	11 2	6 56	19 7	7 17	19 6	1·2
S.	10	3 5	19 9	3 24	19 8	0 58	11 1	1 18	11 0	7 37	19 5	7 56	19 4	2·2
S.	11	3 41	19 7	3 59	19 6	1 37	10 11	1 55	10 10	8 13	19 3	8 30	19 1	3·2
M.	12	4 17	19 5	4 35	19 4	2 13	10 9	2 31	10 8	8 48	18 11	9 7	18 8	4·2
Tu.	13	4 53	19 2	5 11	19 0	2 49	10 6	3 8	10 5	9 26	18 5	9 45	18 2	5·2
W.	14	5 30	18 9	5 49	18 6	3 27	10 4	3 46	10 3	10 4	17 11	10 25	17 8	6·2
Th.	15	6 9	18 3	6 30	18 0	4 5	10 2	4 25	10 1	10 47	17 5	11 11	17 2	7·2
F.	16	6 52	17 9	7 15	17 6	4 46	10 0	5 9	9 11	11 38	16 11			☽
S.	17	7 39	17 4	8 7	17 3	5 33	9 10	5 59	9 9	0 7	16 8	0 36	16 6	9·2
S.	18	8 37	17 4	9 9	17 5	6 29	9 9	7 2	9 10	1 5	16 5	1 34	16 5	10·2
M.	19	9 41	17 7	10 13	17 9	7 35	9 10	8 7	9 11	2 3	16 6	2 32	16 10	11·2
Tu.	20	10 45	17 11	11 15	18 1	8 38	10 1	9 8	10 3	3 1	17 3	3 30	17 9	12·2
W.	21	11 44	18 5			9 38	10 6	10 7	10 9	3 59	18 2	4 27	18 8	13·2
Th.	22	0 15	18 9	0 43	19 4	10 35	10 11	11 2	11 2	4 53	19 2	5 18	19 7	14·2
F.	23	1 10	19 8	1 35	20 0	11 27	11 4	11 52	11 6	5 43	20 0	6 8	20 4	O
S.	24	1 59	20 3	2 23	20 6	—	—	0 17	11 7	6 34	20 7	7 0	20 10	16·2
S.	25	2 47	20 9	3 11	20 11	0 42	11 8	1 6	11 8	7 25	21 1	7 49	21 3	17·2
M.	26	3 34	20 11	3 58	21 0	1 30	11 8	1 54	11 7	8 13	21 4	8 37	21 3	18·2
Tu.	27	4 22	21 0	4 46	20 11	2 18	11 6	2 43	11 5	9 1	21 0	9 25	20 8	19·2
W.	28	5 10	20 8	5 35	20 5	3 8	11 4	3 32	11 2	9 49	20 4	10 14	20 0	20·2
Th.	29	6 0	20 1	6 25	19 8	3 56	11 0	4 20	10 10	10 41	19 6	11 9	19 0	21·2
F.	30	6 50	19 3	7 17	18 9	4 45	10 8	5 11	10 6	11 39	18 7	—	—	☾

Half mean spring range — London 10ft. 4in. — Harwich 5ft. 9in. — Hull 10ft. 5in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	2 26	Add.	9	1 2	Add.	17	0 38	Sub.	25	2 20	Sub.
2	2 16		10	0 50		18	0 50		26	2 33	
3	2 7		11	0 38		19	1 3		27	2 45	
4	1 57		12	0 26		20	1 16		28	2 58	
5	1 46		13	0 13		21	1 29		29	3 10	
6	1 36		14	0 1		22	1 42		30	3 22	
7	1 25		15	0 12	Sub.	23	1 55				
8	1 13		16	0 25		24	2 8				

The times of high water are given for mean time at place; if Greenwich or Railway time be required,—for LONDON 0 m. | HARWICH subtract 5 m. | HULL add 1 m.

JUNE, 1899.

Week Day	Month Day	Moon's Transit	SUNDERLAND (North dock). APPROXIMATE { RISE 6 5, FALL 6 25 }				NORTH SHIELDS (Low lighthouse). APPROXIMATE { RISE 5 40, FALL 6 45 }				LEITH (East pier). APPROXIMATE { RISE 6 0, FALL 6 15 }			
			Morning Time H.M.	Morning Height F.L.	Afternoon Time H.M.	Afternoon Height F.L.	Morning Time H.M.	Morning Height F.L.	Afternoon Time H.M.	Afternoon Height F.L.	Morning Time H.M.	Morning Height F.L.	Afternoon Time H.M.	Afternoon Height F.L.
Th.	1	6m17	8 58	12 3	9 30	12 5	9 7	12 5	9 42	12 3	8 1	13 11	8 34	13 9
F.	2	7 5	10 4	12 0	10 36	11 11	10 17	12 3	10 49	12 3	9 8	13 8	9 42	13 8
S.	3	7 54	11 7	12 0	11 37	12 1	11 20	12 4	11 51	12 6	10 14	13 9	10 44	13 10
S.	4	8 43			0 6	12 3			0 20	12 7	11 13	13 11	11 41	14 1
M.	5	9 33	0 35	12 6	1 3	12 8	0 47	12 8	1 14	12 10			0 8	14 3
Tu.	6	10 25	1 31	12 10	1 58	13 0	1 40	13 0	2 4	13 2	0 34	14 6	0 58	14 9
W.	7	11 18	2 23	13 1	2 46	13 2	2 26	13 4	2 48	13 5	1 22	14 11	1 45	15 1
Th.	8	0n11	3 8	13 3	3 29	13 4	3 9	13 6	3 29	13 7	2 6	15 3	2 27	15 4
F.	9	1 2	3 49	13 4	4 8	13 5	3 49	13 7	4 9	13 6	2 47	15 3	3 6	15 2
S.	10	1 52	4 27	13 4	4 45	13 3	4 28	13 5	4 47	13 4	3 24	15 1	3 42	14 11
S.	11	2 39	5 2	13 1	5 20	12 11	5 5	13 2	5 24	13 0	4 0	14 9	4 19	14 7
M.	12	3 23	5 39	12 9	5 58	12 7	5 43	12 11	6 2	12 10	4 38	14 6	4 57	14 4
Tu.	13	4 6	6 18	12 5	6 38	12 3	6 21	12 8	6 41	12 6	5 16	14 2	5 36	14 0
W.	14	4 47	6 59	12 1	7 21	11 11	7 1	12 4	7 22	12 2	5 57	13 10	6 19	13 7
Th.	15	5 28	7 43	11 9	8 5	11 7	7 45	12 0	8 9	11 9	6 41	13 4	7 4	13 1
F.	16	6 10	8 29	11 5	8 55	11 3	8 35	11 6	9 4	11 5	7 30	13 0	7 58	12 10
S.	17	6 53	9 23	11 2	9 52	11 1	9 34	11 4	10 5	11 4	8 27	12 9	8 57	12 8
S.	18	7 39	10 23	11 1	10 54	11 2	10 36	11 5	11 7	11 6	9 29	12 9	10 0	12 10
M.	19	8 29	11 24	11 4	11 53	11 7	11 37	11 8			10 30	12 11	10 59	13 2
Tu.	20	9 24			0 21	11 10	0 6	11 11	0 35	12 2	11 27	13 5	11 55	13 9
W.	21	10 23	0 49	12 2	1 17	12 6	1 2	12 5	1 27	12 8			0 21	14 1
Th.	22	11 24	1 45	12 11	2 12	13 1	1 52	13 0	2 16	13 5	0 46	14 6	1 11	15 0
F.	23	m.	2 39	13 7	3 4	13 10	2 40	13 10	3 4	14 1	1 36	15 6	2 1	15 10
S.	24	0 27	3 28	14 1	3 52	14 4	3 28	14 4	3 52	14 7	2 25	16 2	2 49	16 4
S.	25	1 28	4 16	14 7	4 39	14 9	4 16	14 9	4 40	14 10	3 13	16 6	3 36	16 6
M.	26	2 27	5 2	14 9	5 26	14 7	5 4	14 9	5 29	14 8	4 0	16 6	4 25	16 5
Tu.	27	3 21	5 51	14 4	6 17	14 2	5 54	14 6	6 20	14 4	4 50	16 3	5 15	16 1
W.	28	4 13	6 43	13 11	7 9	13 8	6 46	14 2	7 12	13 11	5 41	15 10	6 8	15 7
Th.	29	5 3	7 36	13 4	8 3	13 0	7 38	13 7	8 6	13 3	6 35	15 2	7 3	14 10
F.	30	5 52	8 30	12 8	8 59	12 4	8 36	12 10	9 7	12 5	7 32	14 5	8 2	14 0
Half mean spring range			7ft. 2in.				7ft. 4in.				8ft. 2in.			

Phases of the moon.

	D.	H.	M.	
New	8	6	20	Morning.
First Quarter	16	9	46	Morning.
Full	23	2	20	Afternoon.
Last Quarter	30	4	45	Morning.
In Apogee	13	3		Morning.
In Perigee	25	5		Morning.

Moon's declination at noon.

M.D.	° '	M.D.	° '	M.D.	° '	M.D.	° '
1	0 S. 3	9	23 N. 9	17	8 S. 10	25	17 S. 29
2	5 N.30	10	21 17	18	12 49	26	12 43
3	10 43	11	18 30	19	17 1	27	7 15
4	15 20	12	14 58	20	20 30	28	1 29
5	19 8	13	10 52	21	22 23	29	4 N.14
6	21 55	14	6 21	22	23 57	30	9 36
7	23 32	15	1 35	23	23 22		
8	23 56	16	3 S.18	24	21 9		

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for SUNDERLAND *add* 5 m. | NORTH SHIELDS *add* 6 m. | LEITH *add* 13 m.

JUNE, 1899.

Week Day	Month Day	THURSO (near Scrabster pier) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	GREENOCK (East dock) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	LIVERPOOL (George pier) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	Age at Noon
Th.	1	1 53	10 10	2 27	10 8	5 11	9 0	5 41	8 11	4 26	23 11	4 58	22 2	22·8
F.	2	3 3	10 7	3 38	10 6	6 12	8 10	6 44	8 9	5 33	23 3	6 10	22 1	23·8
S.	3	4 12	10 6	4 45	10 6	7 16	8 8	7 48	8 9	6 45	23 4	7 18	22 4	24·8
S.	4	5 16	10 7	5 44	10 9	8 20	8 10	8 52	8 11	7 50	23 8	8 19	23 1	25·8
M.	5	6 10	11 0	6 34	11 3	9 23	8 11	9 51	9 0	8 47	23 11	9 14	24 0	26·8
Tu.	6	6 56	11 6	7 16	11 9	10 18	9 1	10 43	9 1	9 38	24 8	10 1	24 10	27·8
W.	7	7 36	12 0	7 56	12 2	11 8	9 1	11 32	9 2	10 24	24 10	10 46	25 2	28·8
Th.	8	8 16	12 3	8 35	12 3	11 55	9 2	—	—	11 7	24 11	11 28	25 6	●
F.	9	8 54	12 2	9 13	12 1	0 17	9 2	0 38	9 3	11 49	25 1			1·2
S.	10	9 32	11 11	9 50	11 9	0 58	9 3	1 16	9 3	0 8	25 9	0 27	24 11	2·2
S.	11	10 9	11 7	10 28	11 5	1 34	9 2	1 52	9 2	0 45	25 6	1 3	24 4	3·2
M.	12	10 47	11 3	11 7	11 0	2 10	9 1	2 28	9 1	1 21	24 9	1 39	23 11	4·2
Tu.	13	11 28	10 10	11 49	10 8	2 46	9 0	3 4	9 0	1 57	24 0	2 15	23 1	5·2
W.	14	—	—	0 11	10 5	3 23	8 11	3 42	8 10	2 33	23 4	2 52	22 3	6·2
Th.	15	0 33	10 3	0 56	10 1	4 2	8 9	4 22	8 8	3 12	22 9	3 33	21 5	7·2
F.	16	1 21	9 11	1 48	9 9	4 44	8 7	5 8	8 6	3 56	22 0	4 21	20 11	☽
S.	17	2 17	9 8	2 49	9 7	5 34	8 5	6 2	8 4	4 50	21 5	5 21	20 5	9·2
S.	18	3 24	9 7	3 58	9 7	6 31	8 3	7 1	8 3	5 55	21 3	6 30	20 10	10·2
M.	19	4 30	9 8	5 1	9 10	7 33	8 4	8 5	8 5	7 3	21 6	7 35	21 7	11·2
Tu.	20	5 30	10 1	5 57	10 5	8 37	8 7	9 8	8 9	8 5	22 1	8 33	22 11	12·2
W.	21	6 22	10 10	6 45	11 4	9 37	8 11	10 5	9 1	9 0	23 2	9 26	24 6	13·2
Th.	22	7 7	11 10	7 29	12 4	10 32	9 2	10 59	9 4	9 51	24 6	10 16	25 10	14·2
F.	23	7 51	12 10	8 14	13 1	11 26	9 5	11 53	9 6	10 41	25 5	11 6	27 1	○
S.	24	8 37	13 4	9 1	13 5	—	—	0 19	9 8	11 31	26 4	11 56	28 0	16·2
S.	25	9 25	13 6	9 50	13 6	0 45	9 9	1 10	9 10	—	—	0 21	26 11	17·2
M.	26	10 15	13 4	10 40	13 2	1 34	9 11	1 58	10 0	0 45	28 3	1 9	27 1	18·2
Tu.	27	11 6	12 11	11 32	12 8	2 22	9 11	2 46	9 10	1 33	28 1	1 57	26 5	19·2
W.	28	11 59	12 4	—	—	3 10	9 9	3 34	9 8	2 21	27 4	2 45	25 4	20·2
Th.	29	0 26	12 0	0 54	11 8	3 58	9 6	4 22	9 4	3 9	26 4	3 34	24 2	21·2
F.	30	1 23	11 4	1 53	11 0	4 47	9 3	5 13	9 1	4 0	25 0	4 27	22 8	☾

Half mean spring range } Thurso 6ft 7in.　　Greenock 4ft 10in.　　Liverpool 13ft 9in.

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	2	26	Add	9	1	2	Add	17	0	38	Sub	25	2	20	Sub
2	2	16		10	0	50		18	0	50		26	2	33	
3	2	7		11	0	38		19	1	3		27	2	45	
4	1	57		12	0	26		20	1	16		28	2	58	
5	1	46		13	0	13		21	1	29		29	3	10	
6	1	36		14	0	1		22	1	42		30	3	22	
7	1	25		15	0	12	Sub	23	1	55					
8	1	13		16	0	25		24	2	8					

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for THURSO add 14 m. | GREENOCK add 19 m. | LIVERPOOL add 12 m.

JUNE, 1899.

Week Day.	Month Day.	Moon's Transit.	PEMBROKE (H.M. Dockyard). Approximate — { Rise 6 10 / Fall 6 20 }				PORTISHEAD (Dock entr.). Approximate — { Rise 5 40 / Fall 6 40 }				HOLYHEAD (Pier). Approximate — { Rise 6 20 / Fall 6 0 }			
			MORNING.		AFTERNOON.		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.	
		H. M.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.
Th.	1	6m17	11 32	18 10	11 58	18 8	—	—	0 23	35 5	3 33	13 10	4 7	13 8
F.	2	7 5	—	—	0 26	18 6	0 54	34 10	1 26	34 8	4 42	13 7	5 16	13 7
S.	3	7 54	0 58	18 6	1 35	18 7	1 59	34 9	2 35	35 1	5 48	13 8	6 18	13 10
S.	4	8 43	2 11	18 10	2 45	19 2	3 12	35 7	3 48	36 3	6 48	13 11	7 16	14 1
M.	5	9 33	3 18	19 6	3 49	19 10	4 22	36 10	4 53	37 6	7 43	14 3	8 9	14 5
Tu.	6	10 25	4 18	20 2	4 45	20 5	5 22	37 11	5 49	38 4	8 34	14 7	8 57	14 9
W.	7	11 18	5 11	20 7	5 36	20 9	6 14	38 8	6 37	38 11	9 18	14 10	9 39	14 11
Th.	8	oa11	5 59	20 9	6 20	20 10	6 59	39 1	7 20	39 2	10 0	15 0	10 20	15 0
F.	9	1 2	6 40	20 10	6 59	20 9	7 40	39 1	7 59	38 11	10 38	15 0	10 56	14 11
S.	10	1 52	7 17	20 8	7 35	20 6	8 17	38 7	8 34	38 3	11 13	14 10	11 30	14 8
S.	11	2 39	7 53	20 4	8 11	20 2	8 51	38 0	9 8	37 10	11 48	14 7	—	—
M.	12	3 23	8 29	20 0	8 47	19 9	9 25	37 8	9 42	37 4	0 8	14 6	0 28	14 4
Tu.	13	4 6	9 5	19 6	9 23	19 3	9 59	36 10	10 16	36 4	0 49	14 1	1 10	13 11
W.	14	4 47	9 41	19 0	10 0	18 8	10 34	35 11	10 52	35 5	1 31	13 9	1 52	13 6
Th.	15	5 28	10 19	18 5	10 39	18 1	11 10	34 8	11 29	33 11	2 14	13 4	2 37	13 2
F.	16	6 10	11 0	17 8	11 22	17 5	11 50	33 4	—		3 2	13 0	3 29	12 10
S.	17	6 53	11 46	17 4	—		0 14	32 10	0 41	32 5	3 58	12 9	4 29	12 8
S.	18	7 39	0 13	17 3	0 43	17 3	1 11	32 3	1 43	32 5	5 2	12 9	5 34	12 10
M.	19	8 29	1 17	17 5	1 53	17 9	2 17	32 10	2 52	33 5	6 4	13 0	6 33	13 3
Tu.	20	9 24	2 28	18 1	3 2	18 8	3 28	34 4	4 4	35 4	7 1	13 6	7 29	13 9
W.	21	10 23	3 33	19 4	4 3	20 0	4 37	36 6	5 7	37 8	7 56	14 1	8 22	14 6
Th.	22	11 24	4 33	20 7	5 2	21 2	5 36	38 9	5 59	39 9	8 46	14 11	9 10	15 3
F.	23	m.	5 30	21 8	5 57	22 1	6 32	40 6	6 58	41 4	9 34	15 6	9 58	15 9
S.	24	0 27	6 23	22 6	6 48	22 9	7 23	42 2	7 47	42 7	10 22	16 0	10 45	16 2
S.	25	1 28	7 12	22 11	7 35	23 0	8 11	42 9	8 34	42 10	11 7	16 3	11 30	16 4
M.	26	2 27	7 59	22 11	8 23	22 9	8 57	42 8	9 20	42 6	11 55	16 3	—	—
Tu.	27	3 21	8 47	22 6	9 11	22 2	9 43	42 2	10 6	41 8	0 21	16 1	0 48	15 10
W.	28	4 13	9 35	21 9	9 58	21 3	10 28	41 0	10 50	40 1	1 15	15 7	1 42	15 4
Th.	29	5 3	10 21	20 9	10 44	20 2	11 12	39 1	11 34	37 10	2 9	15 0	2 36	14 8
F.	30	5 52	11 7	19 6	11 31	18 10	11 56	36 6	—		3 4	14 3	3 33	13 11

Half mean spring range {	11 ft. 3 in.	21 ft. 0 in.	8 ft. 0 in.

| *Phases of the moon.* | | | | *Moon's declination at noon.* |

		D.	H. M.	
New	- - -	8	6 20	Morning.
First Quarter	-	16	9 46	Morning.
Full	- - -	23	2 20	Afternoon.
Last Quarter	-	30	4 45	Morning.
In Apogee	- -	13	3	Morning.
In Perigee	-	25	5	Morning.

M.D.	° ′	M.D.	° ′	M.D.	° ′	M.D.	° ′
1	0 8. 3	9	23 N. 9	17	8 S. 10	25	17 S. 29
2	5 N.30	10	21 17	18	12 49	26	12 43
3	10 43	11	18 30	19	17 1	27	7 15
4	15 20	12	14 58	20	20 30	28	1 29
5	19 8	13	10 52	21	22 55	29	4 N.14
6	21 55	14	6 21	22	23 57	30	9 36
7	23 32	15	1 35	23	23 22		
8	23 56	16	3 S.18	24	21 9		

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for PEMBROKE *add* 20 m.   PORTISHEAD *add* 11 m.   HOLYHEAD *add* 18 m.

JUNE, 1899.

Week Day	Month Day	KINGSTOWN (Watering pier) Morning Time H. M.	Height F. I.	Afternoon Time H. M.	Height F. I.	BELFAST (New dock) Morning Time H. M.	Height F. I.	Afternoon Time H. M.	Height F. I.	LONDONDERRY (Ship bridge) Morning Time H. M.	Height F. I.	Afternoon Time H. M.	Height F. I.	☾'s AGE AT NOON. D.
		APPROXIMATE { RISE 6 15 / FALL 6 0 }				APPROXIMATE { RISE 6 20 / FALL 6 0 }				APPROXIMATE { RISE 6 15 / FALL 6 15 }				
Th.	1	+ 30	9 7	5 3	9 6	+ 13	8 8	+ 45	8 7	1 39	6 3	2 19	6 2	22·8
F.	2	5 36	9 5	6 6	9 5	5 17	8 6	5 47	8 5	2 55	6 3	3 26	6 4	23·8
S.	3	6 36	9 6	7 6	9 7	6 18	8 5	6 50	8 5	3 54	6 6	4 19	6 8	24·8
S.	4	7 36	9 9	8 6	9 10	7 21	8 5	7 50	8 6	+ 43	6 9	5 6	6 10	25·8
M.	5	8 35	9 11	9 4	10 0	8 17	8 8	8 43	8 10	5 30	6 10	5 54	6 11	26·8
Tu.	6	9 31	10 1	9 55	10 2	9 8	8 11	9 31	9 0	6 18	7 0	6 42	7 0	27·8
W.	7	10 17	10 3	10 37	10 4	9 53	9 0	10 15	9 1	7 6	7 1	7 29	7 1	28·8
Th.	8	10 57	10 4	11 17	10 4	10 36	9 1	10 56	9 1	7 50	7 2	8 10	7 2	●
F.	9	11 37	10 4	11 57	10 4	11 15	9 0	11 33	9 0	8 28	7 1	8 45	7 0	1·2
S.	10	—	—	0 16	10 3	11 51	8 11	—	—	9 2	6 11	9 19	6 10	2·2
S.	11	0 34	10 2	0 52	10 1	0 9	8 11	0 28	8 11	9 36	6 9	9 53	6 8	3·2
M.	12	1 11	10 0	1 30	9 10	0 48	8 10	1 8	8 10	10 11	6 6	10 29	6 5	4·2
Tu.	13	1 50	9 8	2 10	9 7	1 28	8 9	1 49	8 8	10 48	6 3	11 10	6 2	5·2
W.	14	2 31	9 6	2 52	9 5	2 11	8 7	2 34	8 6	11 35	6 0	—	—	6·2
Th.	15	3 13	9 4	3 35	9 3	2 57	8 5	3 20	8 4	0 3	5 10	0 32	5 8	7·2
F.	16	4 0	9 1	4 27	9 0	3 44	8 3	4 10	8 3	1 2	5 7	1 34	5 7	☽
S.	17	4 56	8 11	5 25	8 10	4 37	8 2	5 6	8 2	2 8	5 7	2 42	5 8	9·2
S.	18	5 54	8 11	6 23	9 0	5 35	8 1	6 5	8 1	3 13	5 10	3 41	6 0	10·2
M.	19	6 52	9 1	7 21	9 3	6 36	8 1	7 6	8 2	4 7	6 2	4 32	6 4	11·2
Tu.	20	7 50	9 5	8 20	9 7	7 36	8 3	8 4	8 5	4 56	6 6	5 19	6 7	12·2
W.	21	8 49	9 9	9 18	10 0	8 30	8 7	8 56	8 10	5 42	6 9	6 6	6 11	13·2
Th.	22	9 45	10 3	10 9	10 6	9 21	9 0	9 46	9 2	6 31	7 1	6 57	7 3	14·2
F.	23	10 33	10 8	10 57	10 10	10 11	9 4	10 35	9 5	7 23	7 5	7 48	7 7	○
S.	24	11 21	11 0	11 45	11 0	10 59	9 6	11 23	9 6	8 12	7 9	8 35	7 10	16·2
S.	25	—	—	0 9	11 1	11 46	9 6	—	—	8 57	7 10	9 19	7 9	17·2
M.	26	0 33	11 1	0 58	11 0	0 34	9 7	—	—	9 41	7 8	10 4	7 7	18·2
Tu.	27	1 24	10 11	1 50	10 9	1 0	9 6	1 27	9 5	10 28	7 6	10 54	7 4	19·2
W.	28	2 16	10 7	2 42	10 5	1 54	9 4	2 22	9 3	11 22	7 1	11 52	6 10	20·2
Th.	29	3 8	10 3	3 34	10 1	2 50	9 1	3 18	8 11	—	—	0 25	6 7	21·2
F.	30	4 2	9 11	4 32	9 8	3 46	8 10	4 14	8 8	1 0	6 4	1 37	6 3	☾

Half mean spring range }   5ft. 6in.   4ft. 9in.   3ft. 10in.

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	2	26	Add.	9	1	2	Add.	17	0	38	Sub.	25	2	20	Sub.
2	2	16		10	0	50		18	0	50		26	2	33	
3	2	7		11	0	38		19	1	3		27	2	45	
4	1	57		12	0	26		20	1	16		28	2	58	
5	1	46		13	0	13		21	1	29		29	3	10	
6	1	36		14	0	1		22	1	42		30	3	22	
7	1	25		15	0	12	Sub.	23	1	55					
8	1	13		16	0	25		24	2	8					

The times of high water are given for Mean time at place ; if Dublin or Railway time be required.—for KINGSTOWN *subtract* 1 m. for Dublin time. | BELFAST *subtract* 2 m. | LONDONDERRY *add* 4 m.

JUNE, 1899.

Week Day	Month Day	Moon's Transit H. M.	Sligo Bay (Mullaghmore) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	Galway (Nimmo pier) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	Queenstown (Scott's wharf) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.
		Approximate	Rise 6 10 / Fall 6 20				Rise 6 30 / Fall 6 0				Rise 6 5 / Fall 6 25			
Th.	1	6m17	11 16	9 2	11 50	9 2	10 24	12 1	10 58	12 0	10 24	10 0	10 55	9 11
F.	2	7 5	—		0 22	9 1	11 32	12 0	—		11 28	9 0	—	
S.	3	7 54	0 53	9 2	1 24	9 3	0 4	12 1	0 35	12 2	0 1	9 10	0 35	9 11
S.	4	8 43	1 53	9 4	2 21	9 6	1 5	12 4	1 33	12 6	1 9	10 0	1 42	10 1
M.	5	9 33	2 48	9 8	3 13	9 10	2 0	12 8	2 27	12 10	2 14	10 3	2 44	10 5
Tu.	6	10 25	3 36	10 0	3 58	10 2	2 53	13 0	3 17	13 2	3 12	10 6	3 38	10 8
W.	7	11 18	4 20	10 3	4 42	10 4	3 40	13 4	4 2	13 5	4 2	10 9	4 25	10 10
Th.	8	0a11	5 4	10 5	5 25	10 6	4 23	13 6	4 43	13 6	4 47	10 11	5 9	10 11
F.	9	1 2	5 45	10 5	6 3	10 4	5 3	13 7	5 23	13 7	5 30	10 11	5 50	10 11
S.	10	1 52	6 21	10 3	6 39	10 1	5 42	13 6	6 0	13 4	6 10	10 6	6 27	10 9
S.	11	2 39	6 57	9 11	7 16	9 9	6 18	13 2	6 37	13 0	6 45	10 9	7 3	10 8
M.	12	3 23	7 35	9 7	7 54	9 5	6 56	12 11	7 15	12 9	7 21	10 6	7 39	10 4
Tu.	13	4 6	8 13	9 3	8 32	9 1	7 35	12 6	7 56	12 3	7 57	10 3	8 15	10 1
W.	14	4 47	8 53	8 11	9 17	8 9	8 17	12 0	8 38	11 9	8 33	9 11	8 52	9 1C
Th.	15	5 28	9 42	8 7	10 9	8 6	9 0	11 6	9 23	11 3	9 11	9 8	9 31	9 6
F.	16	6 10	10 38	8 5	11 8	8 5	9 48	11 1	10 16	10 11	9 53	9 5	10 18	9 4
S.	17	6 53	11 38	8 5	—		10 46	10 11	11 18	11 0	10 45	9 3	11 15	9 3
S.	18	7 39	0 8	8 6	0 38	8 6	11 50	11 1	—		11 47	9 3	—	
M.	19	8 29	1 8	8 7	1 38	8 9	0 21	11 3	0 51	11 6	0 19	9 4	0 52	9 6
Tu.	20	9 24	2 8	9 0	2 36	9 3	1 20	11 10	1 47	12 2	1 25	9 8	1 58	9 1C
W.	21	10 23	3 1	9 6	3 25	9 10	2 14	12 6	2 41	12 11	2 29	10 1	2 57	10 5
Th.	22	11 24	3 49	10 2	4 13	10 6	3 7	13 4	3 32	13 9	3 25	10 9	3 53	11 1
F.	23	m.	4 37	10 10	5 2	11 1	3 57	14 1	4 22	14 5	4 20	11 4	4 46	11 6
S.	24	0 27	5 27	11 3	5 51	11 5	4 47	14 9	5 11	15 0	5 12	11 9	5 37	11 11
S.	25	1 28	6 15	11 5	6 39	11 4	5 35	15 2	6 0	15 3	6 2	12 0	6 26	12 1
M.	26	2 27	7 3	11 3	7 28	11 0	6 25	15 2	6 50	15 0	6 50	12 0	7 14	11 11
Tu.	27	3 21	7 53	10 9	8 18	10 6	7 15	14 9	7 40	14 6	7 38	11 9	8 2	11 7
W.	28	4 13	8 43	10 3	9 9	10 0	8 6	14 2	8 32	13 8	8 25	11 4	8 48	11 1
Th.	29	5 3	9 38	9 9	10 9	9 6	8 58	13 3	9 25	12 9	9 12	10 10	9 36	10 8
F.	30	5 52	10 41	9 3	11 14	9 1	9 53	12 4	10 23	12 0	10 0	10 3	10 26	10 0

Half mean spring range }   5ft 7in.   7ft 5in.   5ft 10in.

Phases of the moon.				*Moon's declination at noon.*							

	D.	H. M.
New - - -	8	6 20 Morning
First Quarter -	16	9 46 Morning
Full - - -	23	2 20 Afternoon
Last Quarter -	30	4 45 Morning
In Apogee -	13	3 Morning
In Perigee -	25	5 Morning

M.D.	o '	M.D.	o '	M.D.	o '	M.D.	o '
1	0 S. 3	9	23 N. 9	17	8 S.10	25	17 S.29
2	5 N.30	10	21 17	18	12 49	26	12 43
3	10 43	11	18 30	19	17 1	27	7 15
4	15 20	12	14 58	20	20 30	28	1 29
5	19 .8	13	10 52	21	22 55	29	4 N.14
6	21 55	14	6 21	22	23 57	30	9 36
7	23 32	15	1 35	23	23 22		
8	23 56	16	3 S.18	24	21 9		

The times of high water are given for Mean time at place ; if Dublin or Railway time be required,—for
SLIGO BAY *add* 9 m. | GALWAY *add* 11 m. | QUEENSTOWN *add* 8 m.

JUNE, 1899.

WEEK DAY.	MONTH DAY.	WATERFORD (Duncannon fort). APPROXIMATE { RISE 0·5 / FALL 0·20															☽'s AGE AT NOON.
		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.						
		Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.					D.
Th.	1	10 46	10 11	11 18	10 9													22·8
F.	2	11 48	10 8	—	—													23·8
S.	3	0 18	10 7	0 48	10 8													24·8
S.	4	1 19	10 9	1 51	10 11													25·8
M.	5	2 25	11 1	2 58	11 2													26·8
Tu.	6	3 28	11 3	3 56	11 5													27·8
W.	7	4 22	11 6	4 47	11 7													28·8
Th.	8	5 10	11 7	5 31	11 7													●
F.	9	5 51	11 7	6 11	11 7													1·2
S.	10	6 29	11 6	6 47	11 6													2·2
S.	11	7 5	11 5	7 23	11 5													3·2
M.	12	7 41	11 4	7 59	11 4													4·2
Tu.	13	8 16	11 3	8 33	11 1													5·2
W.	14	8 50	11 0	9 8	10 10													6·2
Th.	15	9 26	10 8	9 47	10 6													7·2
F.	16	10 12	10 4	10 39	10 2													☽
S.	17	11 7	10 1	11 35	10 0													9·2
S.	18	—	—	0 3	9 11													10·2
M.	19	0 32	10 1	1 2	10 3													11·2
Tu.	20	1 34	10 5	2 7	10 7													12·2
W.	21	2 40	10 11	3 12	11 3													13·2
Th.	22	3 43	11 6	4 13	11 10													14·2
F.	23	4 42	12 0	5 8	12 2													○
S.	24	5 33	12 4	5 58	12 6													16·2
S.	25	6 23	12 8	6 47	12 9													17·2
M.	26	7 12	12 9	7 36	12 9													18·2
Tu.	27	8 0	12 8	8 23	12 6													19·2
W.	28	8 45	12 4	9 6	12 1													20·2
Th.	29	9 28	11 10	9 51	11 6													21·2
F.	30	10 17	11 3	10 46	10 11													☾

Half mean spring range } 6 ft. 2 in.

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D	M.	S.	
1	2	26	Add.	9	1	2	Add.	17	0	38	Sub.	25	2	20	Sub.
2	2	16		10	0	50		18	0	50		26	2	33	
3	2	7		11	0	38		19	1	3		27	2	45	
4	1	57		12	0	26		20	1	16		28	2	58	
5	1	46		13	0	13		21	1	29		29	3	10	
6	1	36		14	0	1		22	1	42		30	3	22	
7	1	25		15	0	12	Sub.	23	1	55					
8	1	13		16	0	25		24	2	8					

The times of high water are given for Mean time at place; if Dublin or Railway time be required,—for WATERFORD add 3 m.

JULY, 1899.

Week Day	Month Day	Moon's Transit H.M.	BREST (Entr. of Dockyard basin) APPROX. RISE 6 10 / FALL 6 20 — Morning Time H.M.	Morning Height F.I.	Afternoon Time H.M.	Afternoon Height F.I.	DEVONPORT (H.M. Dockyard) High Water APPROX. RISE 6 0 / FALL 6 10 — Morning Time H.M.	Morning Height F.I.	Afternoon Time H.M.	Afternoon Height F.I.	Low Water Morning Time H.M.	Morning Height F.I.	Afternoon Time H.M.	Afternoon Height F.I.
S.	1	6m41	9 51	14 11	10 23	14 8	11 25	12 11	11 57	12 11	5 9	3 2	5 40	3 10
S.	2	7 30	10 57	14 6	11 35	14 6	—	—	0 32	12 8	6 13	3 11	6 47	4 1
M.	3	8 21	—		0 13	14 7	1 7	12 8	1 43	12 8	7 22	4 1	7 58	3 10
Tu.	4	9 13	0 48	14 9	1 19	15 0	2 19	12 10	2 53	13 2	8 34	3 6	9 10	3 1
W.	5	10 5	1 48	15 5	2 13	15 10	3 26	13 2	3 56	13 9	9 43	3 0	10 12	2 3
Th.	6	10 57	2 36	16 3	2 58	16 8	4 23	13 7	4 48	14 4	10 38	2 4	11 2	1 5
F.	7	11 47	3 19	17 0	3 39	17 2	5 10	13 11	5 31	14 9	11 24	1 9	11 46	0 11
S.	8	0a35	3 58	17 4	4 17	17 5	5 51	14 1	6 9	15 0	—	—	0 6	1 5
S.	9	1 20	4 35	17 5	4 52	17 6	6 27	14 2	6 44	15 1	0 24	0 6	0 41	1 3
M.	10	2 3	5 8	17 6	5 24	17 6	7 0	14 2	7 15	15 0	0 58	0 5	1 14	1 5
Tu.	11	2 45	5 39	17 5	5 54	17 4	7 29	14 0	7 44	14 8	1 30	0 8	1 45	1 8
W.	12	3 26	6 10	17 2	6 27	17 0	7 59	13 9	8 14	14 2	2 0	1 1	2 15	2 1
Th.	13	4 6	6 45	16 8	7 3	16 4	8 29	13 4	8 44	13 8	2 30	1 9	2 44	2 8
F.	14	4 48	7 22	16 0	7 42	15 7	8 59	13 0	9 16	13 2	2 58	2 6	3 13	3 3
S.	15	5 32	8 2	15 1	8 24	14 8	9 35	12 8	9 55	12 8	3 28	3 2	3 45	3 9
S.	16	6 19	8 48	14 3	9 15	14 0	10 17	12 4	10 43	12 2	4 4	3 11	4 27	4 4
M.	17	7 10	9 47	13 10	10 24	13 10	11 13	12 1	11 47	12 0	4 56	4 6	5 29	4 8
Tu.	18	8 5	11 3	13 11	11 43	14 2	—		0 26	12 2	6 5	4 10	6 42	4 7
W.	19	9 5	—		0 22	14 8	1 6	12 2	1 47	12 8	7 21	4 6	8 2	3 10
Th.	20	10 7	0 58	15 3	1 31	16 0	2 27	12 9	3 6	13 7	8 43	3 7	9 23	2 8
F.	21	11 9	2 0	16 10	2 27	17 8	3 42	13 8	4 14	14 9	10 0	2 5	10 31	1 3
S.	22	m.	2 53	18 6	3 18	19 3	4 44	14 8	5 11	15 8	10 59	1 3	11 26	0 0
S.	23	0 10	3 43	19 8	4 8	20 0	5 37	15 3	6 3	16 4	11 52	0 4	—	
M.	24	1 8	4 32	20 3	4 55	20 4	6 29	15 9	6 53	16 10	0 18	*0 11	0 43	*0 4
Tu.	25	2 2	5 17	20 5	5 38	20 3	7 15	15 10	7 37	16 9	1 7	*1 3	1 30	*0 3
W.	26	2 55	6 0	20 0	6 22	19 7	7 59	15 10	8 21	16 3	1 52	*1 2	2 14	*0 1
Th.	27	3 46	6 44	19 0	7 7	18 4	8 42	15 4	9 1	15 6	2 36	*0 6	2 57	0 3
F.	28	4 36	7 30	17 7	7 53	16 9	9 20	14 9	9 40	14 6	3 16	0 6	3 34	1 6
S.	29	5 27	8 16	15 10	8 41	15 1	10 0	13 10	10 21	13 5	3 52	0 10	4 10	2 7
S.	30	6 18	9 10	14 5	9 43	13 11	10 45	12 11	11 13	12 8	4 30	3 1	4 56	3 9
M.	31	7 10	10 21	13 7	11 3	13 5	11 44	12 4	—		5 28	4 3	6 2	4 6

Half mean spring range   9ft. 6in.   7ft. 9in.

Phases of the moon.				
	D.	H.	M.	
New - - -	7	8	31	Afternoon.
First Quarter -	15	11	59	Afternoon.
Full - - -	22	9	42	Afternoon.
Last Quarter -	29	0	42	Afternoon.
In Apogee -	10	4		Afternoon.
In Perigee -	23	0		Noon.

Moon's declination at noon.

M.D.	o '	M.D.	o '	M.D.	o '	M.D.	o '
1	14 N.23	9	16 N. 3	17	19 S.15	25	3 S.37
2	18 21	10	12 6	18	22 3	26	2 N.20
3	21 21	11	7 42	19	23 39	27	8 0
4	23 15	12	3 1	20	23 48	28	13 5
5	23 57	13	1 S.49	21	22 19	29	17 22
6	23 29	14	6 38	22	19 15	30	20 39
7	21 55	15	11 16	23	14 50	31	22 50
8	19 23	16	15 33	24	9 29		

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for BREST *add* 18 m.   DEVONPORT *add* 17 m.

* Below zero, or datum to which soundings on charts are reduced.

JULY, 1899.

Portsmouth: High Water — APPROXIMATE {RISE 7 20 / FALL 6 10} H. M. — Low Water.
Dover: APPROXIMATE {RISE 5 0 / FALL 7 30} H. M.

Week Day	Month Day	PORTSMOUTH (H.M. Dockyard) High Water Morning Time H.M.	Height F.I.	High Water Afternoon Time H.M.	Height F.I.	Low Water Morning Time H.M.	Height F.I.	Low Water Afternoon Time H.M.	Height F.I.	DOVER (North pier) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	☾'s Age at Noon	D.
S.	1	5 16	11 7	5 45	11 4	10 37	2 11	11 11	3 1	4 52	15 11	5 18	15 6	23·2	
S.	2	6 15	11 1	6 47	11 0	11 46	3 2	—	—	5 46	15 2	6 16	15 0	24·2	
M.	3	7 23	11 1	8 1	11 2	0 22	3 3	0 57	3 1	6 49	15 1	7 26	15 3	25·2	
Tu.	4	8 37	11 3	9 10	11 5	1 29	2 10	1 59	2 6	8 2	15 5	8 35	15 8	26·2	
W.	5	9 40	11 7	10 8	11 10	2 26	2 3	2 52	1 11	9 4	15 11	9 31	16 2	27·2	
Th.	6	10 33	12 0	10 54	12 2	3 16	1 8	3 39	1 6	9 57	16 5	10 21	16 8	28·2	
F.	7	11 15	12 4	11 35	12 5	4 0	1 4	4 21	1 2	10 43	16 11	11 5	17 1	●	
S.	8	11 54	12 6	—	—	4 41	1 1	4 59	1 0	11 26	17 3	11 46	17 4	0·6	
S.	9	0 13	12 7	0 32	12 8	5 16	0 11	5 33	0 10	—	—	0 5	17 5	1·6	
M.	10	0 50	12 7	1 7	12 7	5 50	0 10	6 6	0 10	0 24	17 6	0 42	17 6	2·6	
Tu.	11	1 24	12 6	1 40	12 6	6 22	0 11	6 38	1 0	1 0	17 6	1 17	17 6	3·6	
W.	12	1 56	12 6	2 13	12 5	6 54	1 1	7 10	1 4	1 34	17 5	1 52	17 4	4·6	
Th.	13	2 30	12 4	2 47	12 3	7 26	1 7	7 43	1 10	2 10	17 2	2 28	17 0	5·6	
F.	14	3 4	12 1	3 22	11 11	8 0	2 0	8 18	2 3	2 46	16 9	3 4	16 6	6·6	
S.	15	3 41	11 9	4 0	11 7	8 39	2 6	9 3	2 10	3 22	16 3	3 41	15 11	☽	D
S.	16	4 21	11 4	4 44	11 1	9 30	3 2	10 0	3 5	4 2	15 6	4 25	15 2	8·6	
M.	17	5 10	10 11	5 41	10 9	10 32	3 7	11 6	3 8	4 50	14 10	5 17	14 7	9·6	
Tu.	18	6 15	10 8	6 52	10 8	11 45	3 7	—	—	5 46	14 6	6 19	14 6	10·6	
W.	19	7 31	10 10	8 10	11 2	0 25	3 6	1 3	3 2	6 57	14 10	7 36	15 3	11·6	
Th.	20	8 48	11 6	9 23	11 11	1 37	2 9	2 7	2 3	8 13	15 6	8 47	16 4	12·6	
F.	21	9 54	12 5	10 23	12 10	2 36	1 8	3 3	1 1	9 18	17 0	9 47	17 7	13·6	
S.	22	10 50	13 2	11 15	13 6	3 29	0 8	3 55	0 4	10 15	18 2	10 43	18 8	○	O
S.	23	11 40	13 9	—	—	4 20	0 0	4 45	*0 3	11 11	19 1	11 38	19 5	15·6	
M.	24	0 5	14 0	0 29	14 2	5 9	*0 6	5 31	*0 7	—	—	0 4	19 7	16·6	
Tu.	25	0 53	14 2	1 16	14 1	5 53	*0 8	6 15	*0 8	0 29	19 9	0 53	19 10	17·6	
W.	26	1 39	14 0	2 1	13 11	6 37	*0 6	6 59	*0 4	1 17	19 9	1 40	19 7	18·6	
Th.	27	2 23	13 9	2 45	13 6	7 20	0 1	7 41	0 6	2 3	19 3	2 26	18 11	19·6	
F.	28	3 7	13 2	3 30	12 9	8 2	0 11	8 26	1 5	2 49	18 5	3 12	17 10	20·6	
S.	29	3 53	12 4	4 16	11 11	8 52	1 11	9 20	2 6	3 34	17 2	3 56	16 6	☾	C
S.	30	4 40	11 6	5 7	11 2	9 51	3 0	10 25	3 5	4 19	15 10	4 44	15 3	22·6	
M.	31	5 37	10 10	6 13	10 7	11 3	3 3	11 43	3 9	5 12	14 8	5 44	14 4	23·6	

Half mean spring range } 6ft. 9in. — 9ft. 4in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	3 33	Sub.	9	4 57	Sub.	17	5 54	Sub.	25	6 17	Sub.
2	3 45		10	5 6		18	5 59		26	6 17	
3	3 56		11	5 14		19	6 3		27	6 17	
4	4 7		12	5 22		20	6 7		28	6 16	
5	4 18		13	5 29		21	6 10		29	6 15	
6	4 28		14	5 36		22	6 13		30	6 13	
7	4 38		15	5 43		23	6 15		31	6 10	
8	4 48		16	5 49		24	6 16				

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for PORTSMOUTH add 4 m. | DOVER substract 5 m.
*Below zero, or datum to which soundings on charts are reduced.

JULY, 1899.

Week Day	Month Day	Moon's Transit H. M.	Sheerness (H.M. Dockyard) Morning Time H.M.	Height F. I.	Sheerness Afternoon Time H.M.	Height F. I.	Chatham (H.M. Dockyard) High Water Morning Time H.M.	Height F. I.	Chatham Afternoon Time H.M.	Height F. I.	Low Water Morning Time H.M.	Height F. I.	Low Water Afternoon Time H.M.	Height F. I.
S.	1	6m41	6m27	14 3	6 58	13 11	6 30	15 11	7 1	15 7	—		0 29	2 3
S.	2	7 30	7 31	13 9	8 5	13 8	7 34	15 4	8 8	15 1	1 4	2 5	1 44	2 4
M.	3	8 21	8 39	13 8	9 14	13 9	8 43	15 0	9 20	15 1	2 22	2 3	2 59	2 2
Tu.	4	9 13	9 50	13 10	10 24	14 0	9 58	15 3	10 33	15 6	3 35	2 1	4 11	2 1
W.	5	10 5	10 54	14 2	11 21	14 4	11 3	15 8	11 30	15 10	4 45	2 0	5 16	1 11
Th.	6	10 57	11 46	14 6	—		11 53	16 1	—		5 44	1 10	6 11	1 9
F.	7	11 47	0 9	14 8	0 31	14 10	0 15	16 1	0 37	16 0	6 36	1 9	6 58	1 9
S.	8	0 35	0 52	14 11	1 12	15 0	0 58	16 8	1 18	16 10	7 19	1 8	7 40	1 7
S.	9	1 20	1 31	15 1	1 49	15 2	1 37	16 11	1 55	17 0	8 0	1 6	8 18	1 6
M.	10	2 3	2 6	15 2	2 22	15 2	2 12	17 0	2 28	17 0	8 35	1 5	8 50	1 5
Tu.	11	2 45	2 38	15 2	2 54	15 1	2 43	16 11	2 59	16 10	9 4	1 5	9 18	1 6
W.	12	3 26	3 9	15 1	3 24	15 0	3 15	16 9	3 31	16 8	9 32	1 7	9 46	1 8
Th.	13	4 6	3 40	14 11	3 58	14 9	3 47	16 7	4 3	16 6	10 0	1 9	10 14	1 10
F.	14	4 48	4 16	14 7	4 34	14 5	4 20	16 4	4 37	16 1	10 28	1 11	10 43	2 0
S.	15	5 32	4 52	14 2	5 12	14 0	4 56	15 10	5 15	15 6	10 59	2 1	11 17	2 1
S.	16	6 19	5 34	13 9	5 58	13 3	5 36	15 3	6 0	15 0	11 37	2 9	mid.	3 2
M.	17	7 10	6 24	13 4	6 53	13 2	6 27	14 10	6 57	14 8	—		0 27	3 4
Tu.	18	8 5	7 27	13 1	8 5	13 2	7 32	14 7	8 9	14 6	1 0	3 4	1 40	3 1
W.	19	9 5	8 44	13 4	9 22	13 7	8 48	14 7	9 29	14 11	2 21	2 10	3 2	2 7
Th.	20	10 0	9 59	13 11	10 33	14 3	10 8	15 4	10 42	15 10	3 42	2 4	4 20	2 0
F.	21	11 0	11 4	14 8	11 33	15 1	11 13	16 0	11 41	16 10	4 55	1 8	5 28	1 4
S.	22	m.	—		noon.	15 6	—		0 7	17 5	5 58	1 0	6 26	0 8
S.	23	0 10	0 26	15 11	0 52	16 3	0 32	18 0	0 57	18 4	6 53	0 4	7 19	0 1
M.	24	1 8	1 17	16 6	1 41	16 9	1 22	18 4	1 47	18 11	7 45	*0 2	8 10	*0 5
Tu.	25	2 2	2 4	16 10	2 26	16 10	2 10	19 0	2 31	19 0	8 33	*0 8	8 53	*0 8
W.	26	2 55	2 47	16 10	3 8	16 7	2 52	18 11	3 14	18 4	9 13	*0 8	9 32	*0 6
Th.	27	3 46	3 30	16 7	3 52	16 4	3 36	18 8	3 58	18 4	9 51	*0 4	10 10	*0 4
F.	28	4 36	4 15	16 0	4 38	15 7	4 20	18 0	4 42	17 7	10 29	0 2	10 48	0 7
S.	29	5 27	5 1	15 2	5 24	14 9	4 17	0	5 27	16 5	11 8	1 0	11 29	1 7
S.	30	6 18	5 48	14 3	6 16	13 10	5 51	15 10	6 18	15 5	11 52	2 3	—	
M.	31	7 10	6 48	13 5	7 23	13 2	6 50	15 8	7 27	14 8	0 19	2 4	0 54	3 1

Half mean spring range	Sheerness 8ft 0in.	Chatham 9ft 1in.

Phases of the moon.

	D.	H.	M.	
New	7	8	31	Afternoon.
First Quarter	15	11	59	Afternoon.
Full	22	9	42	Afternoon.
Last Quarter	29	0	42	Afternoon.
In Apogee	10	4		Afternoon.
In Perigee	23	0		Noon.

Moon's declination at noon.

M.D.	o '	M.D.	o '	M.D.	o '	M.D.	o '
1	14 N.23	9	16 N. 3	17	19 S.15	25	3 S.37
2	18 21	10	12 6	18	22 3	26	2 N.20
3	21 21	11	7 42	19	23 39	27	8 0
4	23 15	12	3 1	20	23 48	28	13 5
5	23 57	13	1 S.49	21	22 19	29	17 22
6	23 29	14	6 38	22	19 15	30	20 39
7	21 55	15	11 16	23	14 50	31	22 50
8	19 33	16	15 33	24	9 29		

The times of high water are given for Mean time at place; if Greenwich or Railway time be required, — for SHEERNESS subtract 3 m. | CHATHAM subtract 2 m.
*Below zero, or datum to which soundings on charts are reduced.

JULY, 1899.

Week Day	M.D.	LONDON (London bridge). Approximate {Rise 5 30, Fall 7 0} Morning (H.M. / F.L.)	Afternoon (H.M. / F.L.)	HARWICH (Angel quay). Approximate {Rise 6 25, Fall 6 0} Morning (H.M. / F.L.)	Afternoon (H.M. / F.L.)	HULL (Victoria dock). Approximate {Rise 5 40, Fall 6 30} Morning (H.M. / F.L.)	Afternoon (H.M. / F.L.)	D.
S.	1	7 45 / 18 5	8 14 / 18 2	5 38 / 10 4	6 7 / 10 2	0 11 / 18 1	0 43 / 17 8	23·2
S.	2	8 45 / 18 0	9 18 / 17 11	6 38 / 10 1	7 12 / 10 0	1 14 / 17 4	1 44 / 17 1	24·2
M.	3	9 53 / 17 11	10 28 / 17 11	7 47 / 10 0	8 22 / 10 1	2 14 / 17 0	2 45 / 17 2	25·2
Tu.	4	11 3 / 18 0	11 38 / 18 1	8 57 / 10 2	9 31 / 10 3	3 18 / 17 5	3 52 / 17 8	26·2
W.	5	—	0 11 / 18 4	10 2 / 10 5	10 31 / 10 7	4 23 / 17 11	4 51 / 18 2	27·2
Th.	6	0 40 / 18 7	1 6 / 18 10	10 58 / 10 9	11 22 / 10 10	5 16 / 18 6	5 39 / 18 9	28·2
F.	7	1 30 / 19 0	1 51 / 19 2	11 44 / 10 11	—	6 0 / 18 11	6 21 / 19 1	●
S.	8	2 12 / 19 3	2 32 / 19 4	0 5 / 11 0	0 25 / 11 0	6 42 / 19 2	7 2 / 19 4	0·6
S.	9	2 50 / 19 6	3 7 / 19 7	0 43 / 11 1	1 1 / 11 1	7 21 / 19 5	7 39 / 19 6	1·6
M.	10	3 24 / 19 8	3 41 / 19 8	1 19 / 11 0	1 36 / 11 0	7 56 / 19 6	8 12 / 19 7	2·6
Tu.	11	3 57 / 19 9	4 13 / 19 9	1 53 / 10 11	2 10 / 10 11	8 28 / 19 6	8 44 / 19 5	3·6
W.	12	4 29 / 19 8	4 45 / 19 7	2 26 / 10 10	2 43 / 10 9	9 0 / 19 4	9 17 / 19 1	4·6
Th.	13	5 2 / 19 5	5 19 / 19 3	3 0 / 10 8	3 17 / 10 7	9 34 / 18 10	9 52 / 18 7	5·6
F.	14	5 36 / 19 1	5 54 / 18 10	3 34 / 10 6	3 51 / 10 5	10 10 / 18 4	10 28 / 18 1	6·6
S.	15	6 12 / 18 7	6 32 / 18 3	4 8 / 10 4	4 27 / 10 2	10 48 / 17 9	11 12 / 17 5	☽
S.	16	6 53 / 17 11	7 16 / 17 8	4 47 / 10 0	5 10 / 9 11	11 39 / 17 1	—	8·6
M.	17	7 41 / 17 5	8 9 / 17 4	5 35 / 9 10	6 3 / 9 9	0 9 / 16 9	0 39 / 16 6	9·6
Tu.	18	8 42 / 17 3	9 19 / 17 4	6 35 / 9 9	7 13 / 9 9	1 11 / 16 5	1 43 / 16 5	10·6
W.	19	9 57 / 17 6	10 36 / 17 8	7 52 / 9 10	8 30 / 10 0	2 17 / 16 6	2 52 / 16 11	11·6
Th.	20	11 14 / 17 11	11 50 / 18 5	9 6 / 10 3	9 40 / 10 6	3 27 / 17 6	4 2 / 18 2	12·6
F.	21	—	0 24 / 18 11	10 13 / 10 9	10 44 / 11 0	4 35 / 18 9	5 4 / 19 5	13·6
S.	22	0 53 / 19 6	1 21 / 20 0	11 12 / 11 1	11 39 / 11 6	5 30 / 20 0	5 56 / 20 6	○
S.	23	1 47 / 20 4	2 12 / 20 8	—	0 5 / 11 9	6 22 / 21 0	6 48 / 21 4	15·6
M.	24	2 36 / 21 1	2 59 / 21 4	0 30 / 11 10	0 54 / 11 11	7 13 / 21 8	7 37 / 21 11	16·6
Tu.	25	3 22 / 21 6	3 45 / 21 6	1 17 / 11 11	1 40 / 11 11	7 59 / 22 0	8 21 / 22 1	17·6
W.	26	4 8 / 21 7	4 30 / 21 6	2 3 / 11 10	2 26 / 11 9	8 43 / 21 11	9 5 / 21 8	18·6
Th.	27	4 52 / 21 5	5 14 / 21 1	2 48 / 11 8	3 10 / 11 6	9 28 / 21 2	9 51 / 20 8	19·6
F.	28	5 36 / 20 8	5 58 / 20 3	3 32 / 11 4	3 54 / 11 1	10 14 / 20 1	10 37 / 19 6	20·6
S.	29	6 20 / 19 8	6 43 / 19 1	4 16 / 10 10	4 39 / 10 7	11 1 / 18 10	11 28 / 18 2	☾
S.	30	7 8 / 18 5	7 35 / 17 11	5 2 / 10 4	5 27 / 10 1	11 59 / 17 6	—	22·6
M.	31	8 5 / 17 7	8 38 / 17 4	5 56 / 9 11	6 30 / 9 9	0 33 / 16 11	1 6 / 16 6	23·6

Half mean spring range. — LONDON 10ft. 4in. — HARWICH 5ft. 9in. — HULL 10ft. 5in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	3 33	Sub.	9	4 57	Sub.	17	5 54	Sub.	25	6 17	Sub.
2	3 45		10	5 6		18	5 59		26	6 17	
3	3 56		11	5 14		19	6 3		27	6 17	
4	4 7		12	5 22		20	6 7		28	6 16	
5	4 18		13	5 29		21	6 10		29	6 15	
6	4 28		14	5 36		22	6 13		30	6 13	
7	4 38		15	5 43		23	6 15		31	6 10	
8	4 48		16	5 49		24	6 16				

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for LONDON 0 m. | HARWICH *subtract* 5 m. | HULL *add* 1 m.

JULY, 1899.

Approximate corrections — SUNDERLAND (North dock): Rise 0 5, Fall 0 25 · NORTH SHIELDS (Low lighthouse): Rise 5 40, Fall 0 45 · LEITH (East pier): Rise 6 0, Fall 6 15.

WEEK DAY	MONTH DAY	MOON'S TRANSIT H.M.	SUNDERLAND (North dock)				NORTH SHIELDS (Low lighthouse)				LEITH (East pier)			
			MORNING Time H.M.	Height F.L.	AFTERNOON Time H.M.	Height F.L.	MORNING Time H.M.	Height F.L.	AFTERNOON Time H.M.	Height F.L.	MORNING Time H.M.	Height F.L.	AFTERNOON Time H.M.	Height F.L.
S.	1	6m41	9 29	12 0	0 11	1 9	9 40	12 2	10 13	12 0	8 34	13 8	9 7	13 5
S.	2	7 30	10 33	11 7	11 5	11 6	10 45	11 11	11 17	11 10	9 40	13 3	10 13	13 2
M.	3	8 21	11 38	11 7	—	—	11 51	11 11	—	—	10 46	13 2	11 18	13 3
Tu.	4	9 13	0 11	11 8	0 43	11 10	0 25	12 0	0 56	12 1	11 49	13 4	—	—
W.	5	10 5	1 13	12 0	1 41	12 2	1 24	12 2	1 50	12 4	0 18	13 6	0 44	13 9
Th.	6	10 57	2 8	12 4	2 33	12 6	2 14	12 6	2 37	12 9	1 8	14 0	1 31	14 4
F.	7	11 47	2 56	12 8	3 16	12 10	2 57	12 11	3 16	13 1	1 53	14 7	2 14	14 9
S.	8	0a35	3 35	13 0	3 54	13 2	3 35	13 3	3 54	13 4	2 34	14 11	2 52	15 0
S.	9	1 20	4 12	13 3	4 29	13 4	4 12	13 5	4 30	13 6	3 9	15 1	3 26	15 1
M.	10	2 3	4 45	13 5	5 1	13 4	4 47	13 5	5 4	13 4	3 43	15 1	4 0	15 0
Tu.	11	2 45	5 17	13 3	5 33	13 2	5 21	13 4	5 38	13 3	4 17	14 11	4 33	14 10
W.	12	3 26	5 50	13 1	6 8	12 11	5 55	13 2	6 12	13 1	4 49	14 9	5 6	14 8
Th.	13	4 6	6 26	12 9	6 45	12 7	6 30	13 0	6 48	12 10	5 24	14 7	5 43	14 5
F.	14	4 48	7 4	12 5	7 24	12 3	7 6	12 8	7 25	12 6	6 2	14 2	6 22	13 11
S.	15	5 32	7 44	12 0	8 6	11 9	7 46	12 3	8 10	12 0	6 43	13 8	7 6	13 5
S.	16	6 19	8 30	11 6	8 56	11 4	8 36	11 8	9 5	11 1	7 31	13 2	7 59	12 11
M.	17	7 10	9 25	11 2	9 58	11 1	9 36	11 4	10 11	11 3	8 29	12 9	9 3	12 8
Tu.	18	8 5	10 34	11 0	11 10	11 2	10 46	11 4	11 22	11 6	9 40	12 8	10 17	12 9
W.	19	9 5	11 45	11 4	—	—	11 58	11 9	—	—	10 52	12 11	11 26	13 5
Th.	20	10 7	0 19	11 8	0 52	12 1	0 33	12 0	1 5	12 4	11 59	13 8	—	—
F.	21	11 9	1 24	12 7	1 55	13 1	1 35	12 9	2 2	13 2	0 29	14 4	0 57	14 9
S.	22	m.	2 24	13 7	2 51	14 0	2 28	13 9	2 52	14 2	1 23	15 4	1 49	15 11
S.	23	0 10	3 15	14 4	3 39	14 8	3 16	14 7	3 40	14 11	2 14	16 5	2 38	16 10
M.	24	1 8	4 3	15 0	4 26	15 3	4 1	15 2	4 27	15 4	3 1	17 0	3 24	17 2
Tu.	25	2 2	4 48	15 5	5 10	15 3	4 50	15 4	5 13	15 3	3 46	17 2	4 8	17 1
W.	26	2 55	5 33	15 1	5 56	14 10	5 36	15 2	6 0	15 0	4 31	16 11	4 54	16 9
Th.	27	3 46	6 19	14 6	6 43	14 2	6 23	14 9	6 46	14 5	5 17	16 6	5 41	16 1
F.	28	4 36	7 7	13 9	7 31	13 4	7 10	14 0	7 34	13 7	6 5	15 8	6 30	15 2
S.	29	5 27	7 56	12 10	8 22	12 4	7 59	13 0	8 26	12 6	6 55	14 7	7 21	14 0
S.	30	6 18	8 50	11 10	9 21	11 5	8 56	12 0	9 29	11 7	7 50	13 6	8 23	13 0
M.	31	7 10	9 55	11 1	10 32	10 11	10 6	11 4	10 45	11 2	8 59	12 8	9 38	12 5

Half mean spring range — Sunderland 7ft. 2in. · North Shields 7ft. 4in. · Leith 8ft. 2in.

Phases of the moon.

	D.	H.	M.	
New	7	8	31	Afternoon.
First Quarter	15	11	59	Afternoon.
Full	22	9	42	Afternoon.
Last Quarter	29	0	42	Afternoon.
In Apogee	10	4		Afternoon.
In Perigee	23	0		Noon.

Moon's declination at noon.

M.D.	o '	M.D.	o '	M.D.	o '	M.D.	o '
1	14 N.23	9	16 N. 3	17	19 S.15	25	3 S.37
2	18 21	10	12 6	18	22 3	26	2 N.20
3	21 21	11	7 42	19	23 39	27	8 0
4	23 15	12	3 1	20	23 48	28	13 5
5	23 57	13	1 S.49	21	22 19	29	17 22
6	23 29	14	6 38	22	19 15	30	20 39
7	21 55	15	11 16	23	14 50	31	22 50
8	19 23	16	15 33	24	9 29		

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for SUNDERLAND add 5 m. | NORTH SHIELDS add 6 m. | LEITH add 13 m.

JULY, 1899.

WEEK DAY	MONTH DAY	THURSO (near Scrabster pier). Approximate { Rise 6 30 / Fall 6 0 }				GREENOCK (East dock). Approximate { Rise 6 30 / Fall 6 0 }				LIVERPOOL (George pier). Approximate { Rise 5 35 / Fall 6 50 }				☾'s AGE AT NOON
		MORNING		AFTERNOON		MORNING		AFTERNOON		MORNING		AFTERNOON		
		Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	D.
S.	1	2 25	10 8	3 0	10 4	5 40	8 11	6 9	8 8	4 57	23 4	5 30	21 7	23·2
S.	2	3 35	10 2	4 10	10 0	6 40	8 6	7 13	8 5	6 5	22 3	6 41	21 3	24·2
M.	3	4 45	9 11	5 19	9 10	7 48	8 5	8 25	8 6	7 18	22 0	7 54	21 8	25·2
Tu.	4	5 51	9 11	6 20	10 2	9 0	8 6	9 32	8 7	8 27	22 3	8 57	22 5	26·2
W.	5	6 44	10 6	7 6	10 10	10 1	8 8	10 28	8 9	9 24	22 9	9 48	23 7	27·2
Th.	6	7 26	11 2	7 45	11 6	10 53	8 10	11 17	8 11	10 11	23 6	10 33	24 6	28·2
F.	7	8 4	11 9	8 22	11 11	11 40	8 11	—		10 54	24 2	11 14	25 1	●
S.	8	8 40	12 0	8 58	12 0	0 2	9 0	0 22	9 1	11 33	24 7	11 52	25 7	0·6
S.	9	9 16	12 1	9 33	12 1	0 41	9 2	0 59	9 2	—	—	0 10	25 1	1·6
M.	10	9 50	12 0	10 7	11 11	1 16	9 3	1 33	9 3	0 27	25 10	0 44	25 1	2·6
Tu.	11	10 23	11 10	10 39	11 9	1 50	9 4	2 6	9 4	1 0	25 9	1 16	24 9	3·6
W.	12	10 56	11 7	11 14	11 5	2 21	9 4	2 37	9 3	1 32	25 4	1 48	24 3	4·6
Th.	13	11 34	11 3	11 54	11 0	2 54	9 2	3 11	9 2	2 5	24 8	2 22	23 7	5·6
F.	14			0 14	10 9	3 28	9 1	3 45	9 0	2 39	24 1	2 57	23 0	6·6
S.	15	0 35	10 6	0 57	10 3	4 4	8 11	4 24	8 10	3 15	23 1	3 35	22 0	☽
S.	16	1 21	10 1	1 49	9 10	4 46	8 9	5 10	8 7	3 57	22 1	4 23	21 1	8·6
M.	17	2 20	9 8	2 55	9 7	5 37	8 5	6 7	8 4	4 52	21 0	5 27	20 7	9·6
Tu.	18	3 35	9 6	4 15	9 7	6 41	8 3	7 18	8 3	6 6	20 7	6 46	21 3	10·6
W.	19	4 53	9 9	5 28	9 11	7 56	8 4	8 34	8 6	7 25	21 2	8 2	22 2	11·6
Th.	20	6 0	10 4	6 28	10 11	9 10	8 8	9 44	8 10	8 36	22 3	9 7	24 1	12·6
F.	21	6 54	11 7	7 18	12 3	10 15	9 1	10 44	9 4	9 35	23 11	10 2	26 1	13·6
S.	22	7 42	12 11	8 6	13 5	11 12	9 6	11 39	9 8	10 28	25 4	10 54	27 6	○
S.	23	8 28	13 9	8 50	14 0	—	—	0 6	9 10	11 19	26 11	11 44	28 8	15·6
M.	24	9 12	14 1	9 35	14 2	0 32	10 0	0 57	10 1	—		0 8	27 10	16·6
Tu.	25	9 58	14 1	10 21	13 11	1 20	10 2	1 42	10 3	0 31	29 6	0 53	27 11	17·6
W.	26	10 45	13 8	11 9	13 4	2 4	10 3	2 26	10 2	1 15	29 1	1 37	27 4	18·6
Th.	27	11 33	12 11	11 57	12 6	2 48	10 1	3 10	9 11	1 59	28 5	2 21	26 2	19·6
F.	28			0 22	12 0	3 32	9 9	3 54	9 6	2 43	27 0	3 5	24 9	20·6
S.	29	0 47	11 5	1 13	10 11	4 16	9 4	4 38	9 1	3 27	25 1	3 50	23 0	☾
S.	30	1 42	10 5	2 14	10 0	5 3	8 10	5 31	8 7	4 16	22 10	4 47	21 4	22·6
M.	31	2 51	9 8	3 33	9 4	6 3	8 4	6 39	8 2	5 23	21 3	6 3	20 5	23·6
Half mean spring range.		6ft. 7in.				4ft. 10in.				13ft. 9in.				

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	3	33	Sub.	9	4	57	Sub.	17	5	54	Sub.	25	6	7	Sub.
2	3	45		10	5	6		18	5	59		26	6	17	
3	3	56		11	5	14		19	6	3		27	6	17	
4	4	7		12	5	22		20	6	7		28	6	16	
5	4	18		13	5	29		21	6	10		29	6	15	
6	4	28		14	5	36		22	6	13		30	6	13	
7	4	38		15	5	43		23	6	15		31	6	10	
8	4	48		16	5	49		24	6	16					

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for THURSO add 14 m. | GREENOCK add 19 m. | LIVERPOOL add 12 m.

JULY, 1899.

Week Day	Month Day	Moon's Transit H.M.	PEMBROKE (H.M. Dockyard). Approximate {Rise 6 10, Fall 6 20} Morning Time H.M.	Height F. I.	Afternoon Time H.M.	Height F. I.	PORTISHEAD (Dock entr.). Approximate {Rise 5 40, Fall 6 40} Morning Time H.M.	Height F. I.	Afternoon Time H.M.	Height F. I.	HOLYHEAD (Pier). Approximate {Rise 6 10, Fall 6 0} Morning Time H.M.	Height F. I.	Afternoon Time H.M.	Height F. I.
S.	1	6m41	11 56	18 4	—		0 21	35 5	0 51	34 4	4 5	13 7	4 39	13 4
S.	2	7 30	0 24	18 0	0 57	17 9	1 22	33 5	1 55	33 4	5 13	13 3	5 45	13 2
M.	3	8 21	1 35	17 8	2 15	17 9	2 34	33 5	3 14	33 9	6 18	13 3	6 52	13 4
Tu.	4	9 13	2 53	18 0	3 27	18 4	3 55	34 3	4 32	34 10	7 24	13 5	7 53	13 7
W.	5	10 5	3 59	18 9	4 28	19 2	5 3	35 6	5 32	36 2	8 20	13 9	8 44	14 0
Th.	6	10 57	4 56	19 6	5 21	19 10	5 59	36 9	6 23	37 3	9 6	14 2	9 27	14 4
F.	7	11 47	5 44	20 1	6 5	20 4	6 45	37 8	7 6	38 2	9 47	14 6	10 7	14 8
S.	8	0a35	6 25	20 6	6 43	20 8	7 25	38 8	7 43	38 10	10 25	14 9	10 41	14 10
S.	9	1 20	7 1	20 10	7 18	20 11	8 0	38 11	8 17	38 11	10 57	14 11	11 13	15 0
M.	10	2 3	7 34	20 10	7 50	20 10	8 33	38 11	8 49	38 10	11 29	14 11	11 46	14 11
Tu.	11	2 45	8 6	20 9	8 22	20 8	9 5	38 10	9 20	38 9	—		0 3	14 10
W.	12	3 26	8 38	20 6	8 55	20 4	9 35	38 6	9 50	38 2	0 20	14 9	0 39	14 7
Th.	13	4 6	9 12	20 1	9 29	19 9	10 6	37 10	10 22	37 4	0 58	14 5	1 17	14 3
F.	14	4 48	9 46	19 5	10 4	19 0	10 38	36 10	10 55	36 3	1 36	14 1	1 55	13 10
S.	15	5 32	10 22	18 9	10 42	18 4	11 12	35 4	11 31	34 5	2 16	13 7	2 38	13 4
S.	16	6 19	11 3	17 10	11 26	17 5	11 52	33 6	—		3 2	13 1	3 30	12 11
M.	17	7 10	11 52	17 2	—		0 17	32 10	0 47	32 3	4 3	12 9	4 38	12 8
Tu.	18	8 5	0 23	17 1	1 0	17 2	1 22	32 1	2 0	32 3	5 14	12 9	5 50	12 10
W.	19	9 5	1 42	17 5	2 24	17 11	2 42	32 10	3 25	33 11	6 26	13 1	7 2	13 4
Th.	20	10 7	3 4	18 7	3 41	19 4	4 7	35 2	4 45	36 4	7 38	13 9	8 7	14 2
F.	21	11 9	4 15	20 3	4 46	21 1	5 18	38 2	5 49	39 6	8 33	14 8	8 58	15 2
S.	22	m.	5 16	21 10	5 44	22 6	6 18	40 10	6 45	42 1	9 23	15 8	9 47	16 0
S.	23	0 10	6 10	23 0	6 35	23 6	7 11	43 2	7 36	43 11	10 11	16 4	10 34	16 7
M.	24	1 8	6 59	23 9	7 22	23 11	7 59	44 3	8 21	44 5	10 55	16 9	11 17	16 10
Tu.	25	2 2	7 44	23 11	8 6	23 9	8 43	44 5	9 4	44 3	11 39	16 10	—	
W.	26	2 55	8 28	23 6	8 50	23 1	9 25	43 11	9 46	43 3	0 2	16 9	0 26	16 6
Th.	27	3 46	9 12	22 6	9 34	21 11	10 6	42 4	10 26	41 3	0 50	16 3	1 14	15 10
F.	28	4 36	9 55	21 2	10 15	20 5	10 46	40 0	11 7	38 6	1 38	15 5	2 3	14 11
S.	29	5 27	10 35	19 7	10 57	18 9	11 26	36 10	11 47	35 2	2 28	14 5	2 53	13 11
S.	30	6 18	11 21	17 11	11 48	17 4	—		0 12	33 9	3 21	13 5	3 54	13 0
M.	31	7 10	—		0 21	16 10	0 42	32 6	1 19	31 8	4 32	12 9	5 11	12 6

Half mean spring range.	11 ft. 3 in.	21 ft. 0 in.	8 ft. 0 in.

Phases of the moon.

	D.	H.	M.	
New - - -	7	8	31	Afternoon.
First Quarter -	15	11	59	Afternoon.
Full - - -	22	9	42	Afternoon.
Last Quarter -	29	0	42	Afternoon.
In Apogee - -	10	4		Afternoon.
In Perigee -	23	0		Noon.

Moon's declination at noon.

M.D.	o	'	M.D.	o	'	M.D.	o	'	M.D.	o	'
1	14 N.	23	9	16 N.	3	17	19 S.	15	25	3 S.	37
2	18	21	10	12	6	18	22	3	26	2 N.	20
3	21	21	11	7	42	19	23	39	27	8	0
4	23	15	12	3	1	20	23	48	28	13	5
5	23	57	13	1 S.	49	21	22	19	29	17	22
6	23	29	14	6	38	22	19	15	30	20	39
7	21	55	15	11	16	23	14	50	31	22	50
8	19	23	16	15	33	24	9	29			

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for PEMBROKE *add* 20 m. | PORTISHEAD *add* 11 m. | HOLYHEAD *add* 18 m.

JULY, 1899.

WEEK DAY.	MONTH DAY.	KINGSTOWN (Watering pier). APPROXIMATE { RISE 6 15 / FALL 6 0 }				BELFAST (New dock). APPROXIMATE { RISE 6 20 / FALL 6 0 }				LONDONDERRY (Ship bridge). APPROXIMATE { RISE 6 15 / FALL 6 15 }				AGE D AT NOON.
		MORNING		AFTERNOON		MORNING		AFTERNOON		MORNING		AFTERNOON		
		Time H.M.	Height F.I.	Time H.M.	Height F.I.	Time H.M.	Height F.I.	Time H.M.	Height F.I.	Time H.M.	Height F.I.	Time H.M.	Height F.I.	D.
S.	1	5 3	9 5	5 33	9 4	4 44	8 6	5 14	8 5	2 15	6 2	2 50	6 1	23·2
S.	2	6 3	9 3	6 33	9 3	5 44	8 4	6 16	8 3	3 22	6 2	3 52	6 3	24·2
M.	3	7 5	9 4	7 39	9 4	6 50	8 2	7 25	8 2	4 21	6 4	4 49	6 4	25·2
Tu.	4	8 12	9 5	8 44	9 6	7 58	8 3	8 27	8·4	5 15	6 5	5 40	6 5	26·2
W.	5	9 14	9 7	9 42	9 8	8 53	8 6	9 18	8 8	6 4	6 6	6 28	6 7	27·2
Th.	6	10 6	9 10	10 26	10 0	9 41	8 9	10 3	8 10	6 52	6 8	7 15	6 9	28·2
F.	7	10 45	10 1	11 4	10 2	10 23	8 11	10 43	8 11	7 37	6 10	7 57	6 11	●
S.	8	11 22	10 3	11 40	10 4	11 1	9 0	11 19	9 0	8 15	7 0	8 32	7 1	0·6
S.	9	11 58	10 4	—	—	11 35	9 0	11 51	9 0	8 48	7 1	9 3	7 0	1·6
M.	10	0 16	10 4	0 33	10 3	—	—	0 7	9 0	9 18	7 0	9 34	6 11	2·6
Tu.	11	0 50	10 3	1 7	10 2	0 24	9 0	0 41	9 0	9 50	6 10	10 6	6 9	3·6
W.	12	1 23	10 1	1 40	10 0	0 59	9 0	1 17	8 11	10 22	6 8	10 38	6 7	4·6
Th.	13	1 58	9 11	2 17	9 10	1 37	8 11	1 57	8 10	10 55	6 6	11 15	6 5	5·6
F.	14	2 36	9 9	2 55	9 7	2 17	8 9	2 37	8 8	11 38	6 3	—	—	6·6
S.	15	3 15	9 6	3 37	9 4	2 58	8 7	3 20	8 5	0 3	6 0	0 31	5 10	☽
S.	16	4 1	9 3	4 28	9 1	3 44	8 4	4 11	8 3	1 2	5 9	1 35	5 8	8·6
M.	17	4 58	8 11	5 30	8 10	4 40	8 2	5 12	8 1	2 11	5 7	2 48	5 8	9·6
Tu.	18	6 4	8 11	6 38	9 0	5 45	8 1	6 20	8 1	3 23	5 10	3 55	6 0	10·6
W.	19	7 13	9 2	7 48	9 4	6 57	8 2	7 33	8 3	4 26	6 2	4 56	6 5	11·6
Th.	20	8 23	9 7	8 57	9 10	8 7	8 5	8 38	8 8	5 23	6 7	5 50	6 9	12·6
F.	21	9 28	10 1	9 56	10 5	9 6	8 11	9 32	9 2	6 17	7 0	6 44	7 4	13·6
S.	22	10 21	10 9	10 45	11 0	9 58	9 4	10 23	9 6	7 11	7 7	7 37	7 9	○
S.	23	11 9	11 2	11 33	11 4	10 47	9 8	11 11	9 8	8 2	7 11	8 25	8 1	15·6
M.	24	11 56	11 5	—	—	11 34	9 9	11 56	9 9	8 46	8 2	9 6	8 2	16·6
Tu.	25	0 19	11 6	0 42	11 5	—	—	0 18	9 10	9 27	8 1	9 48	8 0	17·6
W.	26	1 5	11 4	1 28	11 2	0 41	9 9	1 5	9 8	10 9	7 10	10 31	7 8	18·6
Th.	27	1 51	11 0	2 15	10 9	1 29	9 7	1 54	9 6	10 54	7 5	11 19	7 2	19·6
F.	28	2 39	10 6	3 3	10 3	2 19	9 4	2 44	9 1	11 47	6 10	—	—	20·6
S.	29	3 27	10 0	3 52	9 8	3 9	8 11	3 35	8 8	0 17	6 6	0 49	6 2	☾
S.	30	4 20	9 4	4 52	9 1	4 3	8 6	4 34	8 4	1 25	5 11	2 4	5 9	22·6
M.	31	5 26	8 11	6 2	8 9	5 7	8 2	5 43	8 0	2 44	5 8	3 21	5 8	23·6

Half mean spring range } Kingstown 5ft. 6in. — Belfast 4ft. 9in. — Londonderry 3ft. 10in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	3 33	Sub.	9	4 57	Sub.	17	5 54	Sub.	25	6 17	Sub.
2	3 45		10	5 6		18	5 59		26	6 17	
3	3 56		11	5 14		19	6 3		27	6 17	
4	4 7		12	5 22		20	6 7		28	6 16	
5	4 18		13	5 29		21	6 10		29	6 15	
6	4 28		14	5 36		22	6 13		30	6 13	
7	4 38		15	5 43		23	6 15		31	6 10	
8	4 48		16	5 49		24	6 16				

The times of high water are given for Mean time at place ; if Dublin or Railway time be required,—for KINGSTOWN *subtract* 1 m. for Dublin time. | BELFAST *subtract* 2 m. | LONDONDERRY *add* 4 m.

JULY, 1899.

WEEK DAY	MONTH DAY	MOON'S TRANSIT H. M.	SLIGO BAY (Mullaghmore) MORNING Time H. M.	Height F. I.	AFTERNOON Time H. M.	Height F. I.	GALWAY (Nimmo pier) MORNING Time H. M.	Height F. I.	AFTERNOON Time H. M.	Height F. I.	QUEENSTOWN (Scott's wharf) MORNING Time H. M.	Height F. I.	AFTERNOON Time H. M.	Height F. I.
S.	1	6m 41	11 47	8 11	—		10 55	11 9	11 28	11 7	10 56	9 9	11 27	9 7
S.	2	7 30	0 18	8 10	0 49	8 9	—		0 1	11 6	11 59	9 6	—	
M.	3	8 21	1 23	8 10	1 58	8 10	0 35	11 6	1 9	11 7	0 34	9 6	1 12	9 6
Tu.	4	9 13	2 31	8 11	3 0	9 1	1 42	11 8	2 12	11 10	1 49	9 7	2 23	9 8
W.	5	10 5	3 24	9 3	3 46	9 6	2 39	12 1	3 4	12 8	2 54	9 10	3 22	10 0
Th.	6	10 57	4 8	9 8	4 29	9 10	3 28	12 6	3 50	12 8	3 48	10 3	4 11	10 5
F.	7	11 47	4 50	10 0	5 10	10 2	4 10	12 10	4 30	13 1	4 33	10 7	4 54	10 8
S.	8	0n35	5 30	10 3	5 48	10 4	4 48	13 3	5 6	13 5	5 14	10 9	5 33	10 10
S.	9	1 20	6 5	10 5	6 22	10 4	5 24	13 6	5 42	13 7	5 51	10 11	6 9	10 11
M.	10	2 3	6 39	10 3	6 56	10 3	5 59	13 7	6 16	13 6	6 26	11 0	6 42	11 0
Tu.	11	2 45	7 12	10 2	7 27	10 0	6 32	13 6	6 48	13 5	6 58	10 11	7 14	10 10
W.	12	3 26	7 43	9 10	8 0	9 8	7 5	13 3	7 23	13 1	7 30	10 9	7 47	10 7
Th.	13	4 8	8 18	9 6	8 37	9 4	7 42	12 11	8 1	12 8	8 4	10 5	8 21	10 4
F.	14	4 48	8 57	9 2	9 19	9 0	8 20	12 5	8 40	12 1	8 38	10 2	8 55	10 0
S.	15	5 32	9 43	8 10	10 10	8 8	9 1	11 9	9 24	11 5	9 14	9 10	9 34	9 8
S.	16	6 19	10 40	8 6	11 12	8 5	9 50	11 2	10 19	10 11	9 56	9 5	10 21	9 3
M.	17	7 10	11 44	8 4	—		10 52	10 10	11 28	10 11	10 51	9 2	11 26	9 2
Tu.	18	8 5	0 18	8 5	0 54	8 6	—		0 1	11 1	—		0 4	9 3
W.	19	9 5	1 30	8 8	2 6	8 10	0 43	11 4	1 18	11 8	0 42	9 4	1 21	9 7
Th.	20	10 7	2 39	9 2	3 9	9 7	1 50	12 1	2 21	12 7	2 0	9 10	2 36	10 2
F.	21	11 9	3 36	10 0	4 1	10 5	2 51	13 1	3 19	13 8	3 8	10 7	3 38	11 0
S.	22	m.	4 26	10 6	4 51	11 3	3 45	14 3	4 10	14 9	4 6	11 5	4 33	11 9
S.	23	0 10	5 16	11 6	5 40	11 6	4 35	15 2	4 59	15 6	4 59	12 0	5 25	12 3
M.	24	1 8	6 3	11 11	6 26	11 10	5 23	15 9	5 46	15 10	5 50	12 4	6 13	12 5
Tu.	25	2 2	6 48	11 11	7 10	11 8	6 9	15 11	6 31	15 9	6 35	12 6	6 57	12 3
W.	26	2 55	7 32	11 1	7 54	11 1	6 54	15 4	7 17	15 2	7 19	12 3	7 41	12 0
Th.	27	3 46	8 17	10 8	8 40	10 5	7 40	14 9	8 4	14 3	8 3	11 9	8 24	11 5
F.	28	4 36	9 5	10 3	9 31	9 7	8 28	13 8	8 52	13 0	8 45	11 1	9 6	10 8
S.	29	5 27	9 59	9 3	10 30	8 11	9 16	12 4	9 43	11 9	9 27	10 3	9 49	9 9
S.	30	6 18	11 4	8 7	11 40	8 5	10 13	11 4	10 48	10 11	10 15	9 6	10 47	9 3
M.	31	7 10	—		0 17	8 3	11 26	10 9	—		11 24	9 0	—	

Half mean spring range.	SLIGO 5ft. 7in.	GALWAY 7ft. 5in.	QUEENSTOWN 5ft. 10in.

Phases of the moon.

	D.	H.	M.	
New	7	8	31	Afternoon.
First Quarter	15	11	59	Afternoon.
Full	22	9	42	Afternoon.
Last Quarter	29	0	42	Afternoon.
In Apogee	10	4		Afternoon.
In Perigee	23	0		Noon.

Moon's declination at noon.

M.D.	° ′	M.D.	° ′	M.D.	° ′	M.D.	° ′
1	14 N. 23	9	16 N. 3	17	19 S. 15	25	3 S.37
2	18 21	10	12 6	18	22 3	26	2 N.20
3	21 21	11	7 42	19	23 39	27	8 0
4	23 15	12	3 1	20	23 48	28	13 5
5	23 57	13	1 8.49	21	22 19	29	17 22
6	23 29	14	6 38	22	19 15	30	20 39
7	21 55	15	11 16	23	14 50	31	22 50
8	19 23	16	15 33	24	9 29		

The times of high water are given for Mean time at place; if Dublin or Railway time be required, —for SLIGO BAY add 9 m. | GALWAY add 11 m. | QUEENSTOWN add 8 m.

JULY, 1899.

WATERFORD (*Duncannon fort*).

APPROXIMATE - { Rise 6 5 / Fall 6 20 } H. M.

Week Day	Month Day	Morning Time H. M.	Height F. I.	Afternoon Time H. M.	Height F. I.	D's Age at Noon
S.	1	11 15	10 7	11 44	10 4	23·2
S.	2	—	—	0 14	10 2	24·2
M.	3	0 46	10 3	1 21	10 3	25·2
Tu.	4	1 58	10 4	2 34	10 6	26·2
W.	5	3 8	10 8	3 38	10 10	27·2
Th.	6	4 6	11 0	4 31	11 2	28·2
F.	7	4 55	11 3	5 17	11 4	●
S.	8	5 36	11 5	5 54	11 6	0·6
S.	9	6 12	11 7	6 29	11 8	1·6
M.	10	6 46	11 8	7 3	11 8	2·6
Tu.	11	7 19	11 9	7 35	11 8	3·6
W.	12	7 51	11 8	8 7	11 7	4·6
Th.	13	8 23	11 6	8 39	11 4	5·6
F.	14	8 55	11 2	9 11	11 0	6·6
S.	15	9 28	10 10	9 48	10 8	☽
S.	16	10 13	10 5	10 41	10 2	8·6
M.	17	11 12	10 0	11 44	9 11	9·6
Tu.	18	—	—	0 18	9 11	10·6
W.	19	0 54	10 1	1 31	10 3	11·6
Th.	20	2 9	10 7	2 47	11 0	12·6
F.	21	3 23	11 4	3 56	11 9	13·6
S.	22	4 26	12 2	4 55	12 5	○
S.	23	5 21	12 8	5 46	12 10	15·6
M.	24	6 10	13 0	6 33	13 2	16·6
Tu.	25	6 56	13 3	7 18	13 3	17·6
W.	26	7 40	13 1	8 2	12 11	18·6
Th.	27	8 23	12 8	8 43	12 5	19·6
F.	28	9 3	12 1	9 22	11 8	20·6
S.	29	9 42	11 3	10 5	10 10	☾
S.	30	10 34	10 6	11 8	10 1	22·6
M.	31	11 43	9 9	—	—	23·6

Half mean spring range } 6ft. 2in.

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	3	33	Sub.	9	4	57	Sub.	17	5	54	Sub.	25	6	17	Sub.
2	3	45		10	5	6		18	5	59		26	6	17	
3	3	56		11	5	14		19	6	3		27	6	17	
4	4	7		12	5	22		20	6	7		28	6	16	
5	4	18		13	5	29		21	6	10		29	6	15	
6	4	28		14	5	36		22	6	13		30	6	13	
7	4	38		15	5	43		23	6	15		31	6	10	
8	4	48		16	5	49		24	6	16					

The times of high water are given for Mean time at place; if Dublin or Railway time be required,—for WATERFORD *add* 3 m.

AUGUST, 1899.

WEEK DAY	MONTH DAY	MOON'S TRANSIT	BREST (Entr. of Dockyard basin) APPROXIMATE RISE 6 10 / FALL 6 20 — High Water Morning Time H.M.	Height F.L.	Afternoon Time H.M.	Height F.L.	DEVONPORT (H.M. Dockyard) APPROX. RISE 6 0 / FALL 6 10 — High Water Morning Time H.M.	Height F.L.	Afternoon Time H.M.	Height F.L.	Low Water Morning Time H.M.	Height F.L.	Afternoon Time H.M.	Height F.L.
Tu.	1	8 2	11 46	13 5	—		0 21	11 10	1 1	12 1	6 38	4 11	7 16	4 8
W.	2	8 54	0 27	13 7	1 3	14 0	1 42	11 10	2 22	12 6	7 56	4 8	8 38	3 10
Th.	3	9 44	1 34	14 6	2 1	15 1	3 0	12 3	3 35	13 4	9 18	3 11	9 53	2 10
F.	4	10 32	2 24	15 8	2 45	16 3	4 5	12 11	4 30	14 1	10 21	3 1	10 45	1 10
S.	5	11 18	3 4	16 9	3 23	17 2	4 52	13 6	5 12	14 7	11 7	2 3	11 27	1 1
S.	6	0 2	3 40	17 6	3 56	17 9	5 31	13 11	5 49	15 0	11 47	1 9	—	
M.	7	0 44	4 12	17 11	4 28	18 1	6 6	14 3	6 23	15 3	0 5	0 6	0 22	1 2
Tu.	8	1 25	4 43	18 2	4 58	18 3	6 39	14 6	6 53	15 3	0 37	0 3	0 52	1 0
W.	9	2 6	5 13	18 3	5 28	18 2	7 7	14 6	7 21	15 0	1 7	0 4	1 22	1 1
Th.	10	2 47	5 43	18 1	5 58	17 11	7 35	14 4	7 50	14 8	1 37	0 9	1 52	1 4
F.	11	3 30	6 14	17 8	6 30	17 3	8 5	14 1	8 20	14 1	2 6	1 1	2 20	1 9
S.	12	4 15	6 47	16 10	7 5	16 4	8 35	13 8	8 50	13 7	2 34	1 10	2 48	2 4
S.	13	5 3	7 25	15 9	7 47	15 2	9 6	13 3	9 23	13 1	3 2	2 8	3 18	3 1
M.	14	5 55	8 11	14 8	8 37	14 1	9 44	12 10	10 8	12 6	3 35	3 3	3 55	3 8
Tu.	15	6 50	9 8	13 9	9 45	13 7	10 35	12 5	11 7	11 10	4 18	4 1	4 47	4 4
W.	16	7 49	10 29	13 8	11 15	13 10	11 45	12 2	—		5 22	4 10	6 3	4 8
Th.	17	8 50	—		noon	14	0 28	11 10	1 15	12 7	6 46	4 11	7 30	4 0
F.	18	9 50	0 40	14 11	1 15	15 10	2 1	12 6	2 43	13 7	8 16	3 11	9 1	2 8
S.	19	10 49	1 46	16 10	2 13	17 0	3 23	13 6	3 59	14 11	9 41	2 8	10 14	1 1
S.	20	11 46	2 38	18 9	3 2	19 8	4 29	14 7	4 56	15 11	10 43	0 4	11 10	*0 3
M.	21	m.	3 25	20 3	3 48	20 8	5 22	15 6	5 47	16 8	11 36	0 2	—	
Tu.	22	0 40	4 11	20 11	4 33	21 0	6 11	16 4	6 35	17 0	0 2	*1 2	0 26	*0 1
W.	23	1 33	4 54	21 0	5 15	20 10	6 58	16 4	7 19	16 10	0 49	*1 7	1 11	*0 9
Th.	24	2 26	5 36	20 5	5 56	19 11	7 38	16 2	7 57	16 4	1 32	*1 4	1 53	*0 6
F.	25	3 18	6 16	19 4	6 37	18 7	8 16	15 8	8 34	15 5	2 13	*0 7	2 33	0 3
S.	26	4 11	6 58	17 8	7 20	16 9	8 51	14 10	9 10	14 5	2 51	0 6	3 8	1 2
S.	27	5 4	7 44	15 9	8 10	14 10	9 30	13 11	9 50	13 5	3 24	1 10	3 41	2 5
M.	28	5 57	8 38	14 0	9 10	13 4	10 12	12 11	10 37	12 5	4 0	3 3	4 22	3 9
Tu.	29	6 49	9 48	12 10	10 32	12 8	11 6	12 0	11 43	11 3	4 50	4 6	5 24	4 9
W.	30	7 40	11 17	12 9	mid.	13	—		0 24	11 9	6 1	5 6	6 39	5 0
Th.	31	8 29	—		0 39	13 6	1 7	11 3	1 50	12 3	7 20	5 4	8 4	4 2

Half mean spring range }   BREST 9 ft. 6 in.   DEVONPORT 7 ft. 9 in.

Phases of the moon.

	D.	H.	M.	
New	6	11	48	Morning.
First Quarter	14	11	54	Morning.
Full	21	4	45	Morning.
Last Quarter	27	11	57	Afternoon.
In Apogee	6	10		Afternoon.
In Perigee	20	10		Afternoon.

Moon's declination at noon.

M.D.	o '	M.D.	o '	M.D.	o '	M.D.	o '
1	23 N.49	9	0 S.29	17	23 S.1	25	15 N.53
2	23 39	10	5 17	18	20 42	26	19 35
3	22 22	11	9 56	19	16 56	27	22 8
4	20 5	12	14 15	20	12 0	28	23 29
5	16 58	13	18 13	21	6 18	29	23 37
6	13 11	14	21 5	22	0 15	30	22 37
7	8 54	15	23 5	23	5 N.42	31	20 36
8	4 18	16	23 48	24	11 10		

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for BREST *add* 18 m.   DEVONPORT *add* 17 m.

* Below zero, or datum to which soundings on charts are reduced.

AUGUST, 1899.

Portsmouth (H.M. Dockyard). High Water. Approximate — Rise 7 20, Fall 5 10. Low Water.
Dover (North pier). Approximate — Rise 5 0, Fall 7 30.

Week Day	M.D.	Portsmouth High Water Morning Time	Ht.	Afternoon Time	Ht.	Low Water Morning Time	Ht.	Afternoon Time	Ht.	Dover Morning Time	Ht.	Afternoon Time	Ht.	D's Age at Noon
Tu.	1	6 53	10 5	7 34	10 6	—	—	0 25	3 9	6 20	14 1	7 0	14 3	24·6
W.	2	8 14	10 8	8 52	10 10	1 6	3 7	1 42	3 3	7 40	14 5	8 17	14 9	25·6
Th.	3	9 25	11 1	9 54	11 5	2 13	2 11	2 40	2 6	8 49	15 2	9 17	15 7	26·6
F.	4	10 19	11 9	10 41	12 0	3 4	2 1	3 26	1 9	9 42	16 0	10 5	16 7	27·6
S.	5	11 0	12 2	11 19	12 4	3 47	1 6	4 7	1 3	10 26	16 9	10 46	17 0	28·6
S.	6	11 36	12 6	11 53	12 8	4 25	1 1	4 41	0 11	11 5	17 3	11 23	17 6	●
M.	7	—	—	0 10	12 10	4 57	0 9	5 12	0 7	11 41	17 9	11 58	17 11	1·0
Tu.	8	0 26	13 0	0 42	13 0	5 27	0 6	5 42	0 6	—	—	0 15	18 0	2·0
W.	9	0 58	13 0	1 14	12 11	5 57	0 6	6 12	0 6	0 32	18 0	0 49	18 1	3·0
Th.	10	1 29	12 11	1 44	12 10	6 27	0 7	6 42	0 8	1 5	18 0	1 21	18 0	4·0
F.	11	1 59	12 9	2 14	12 8	6 57	0 10	7 12	1 1	1 37	17 10	1 54	17 8	5·0
S.	12	2 30	12 6	2 47	12 4	7 27	1 5	7 43	1 9	2 11	17 6	2 29	17 2	6·0
S.	13	3 6	12 1	3 25	11 10	8 1	2 0	8 22	2 4	2 47	16 10	3 6	16 5	7·0
M.	14	3 45	11 7	4 7	11 4	8 46	2 9	9 14	3 4	3 26	16 0	3 48	15 6	☽
Tu.	15	4 33	11 0	5 3	10 10	9 46	3 7	10 22	3 9	4 13	15 1	4 41	14 8	9·0
W.	16	5 39	10 8	6 20	10 6	11 4	3 10	11 50	3 9	5 13	14 4	5 50	14 3	10·0
Th.	17	7 4	10 8	7 48	11 0	—	—	0 36	3 6	6 31	14 6	7 13	15 0	11·0
F.	18	8 30	11 4	9 7	11 10	1 18	3 0	1 53	2 5	7 53	15 6	8 30	16 3	12·0
S.	19	9 40	12 4	10 8	12 11	2 23	1 10	2 51	1 2	9 3	17 0	9 32	17 9	13·0
S.	20	10 34	13 4	10 58	13 9	3 16	0 8	3 40	0 2	9 58	18 5	10 24	19 1	14·0
M.	21	11 21	14 1	11 44	14 4	4 3	*0 3	4 26	*0 7	10 50	19 7	11 6	19 11	○
Tu.	22	—	—	0 7	14 6	4 49	*0 10	5 11	*1 0	11 41	20 0	—	—	16·0
W.	23	0 30	14 6	0 53	14 5	5 32	*1 0	5 53	*1 0	0 0	20 3	0 28	20 4	17·0
Th.	24	1 15	14 4	1 37	14 1	6 14	*0 10	6 35	*0 8	0 51	20 2	1 14	19 11	18·0
F.	25	1 58	13 10	2 19	13 7	6 55	*0 3	7 15	0 2	1 36	19 6	1 58	19 1	19·0
S.	26	2 39	13 2	3 0	12 9	7 34	0 9	7 54	1 3	2 19	18 6	2 40	17 10	20·0
S.	27	3 21	12 4	3 43	11 10	8 17	1 10	8 43	2 6	3 2	17 3	3 25	16 5	☾
M.	28	4 7	11 4	4 34	10 11	9 13	3 1	9 48	3 8	3 49	15 8	4 14	14 11	22·0
Tu.	29	5 5	10 6	5 41	10 3	10 27	4 0	11 9	4 2	4 42	14 3	5 15	13 9	23·0
W.	30	6 23	10 1	7 8	10 1	11 56	4 3	—	—	5 53	13 6	6 34	13 7	24·0
Th.	31	7 50	10 3	8 29	10 6	0 42	4 1	1 21	3 9	7 16	13 11	7 55	14 4	25·0

Half mean spring range: 6ft. 9in.   9ft. 4in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	6 7	Sub.	9	5 20	Sub.	17	3 56	Sub.	25	1 59	Sub.
2	6 3		10	5 12		18	3 43		26	1 42	
3	5 59		11	5 2		19	3 29		27	1 25	
4	5 54		12	4 53		20	3 15		28	1 8	
5	5 48		13	4 42		21	3 1		29	0 50	
6	5 42		14	4 32		22	2 46		30	0 32	
7	5 35		15	4 20		23	2 31		31	0 14	
8	5 28		16	4 8		24	2 15				

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for Portsmouth add 4 m. | Dover subtract 5 m.
* Below zero, or datum to which soundings on charts are reduced.

TIDE TABLES FOR THE

AUGUST, 1899.

WEEK DAY	MONTH DAY	MOON'S TRANSIT H.M.	SHEERNESS (H.M. Dockyard). APPROXIMATE - {RISE 6 5 / FALL 6 25}				CHATHAM (H.M. Dockyard). APPROXIMATE - {RISE 6 35 / FALL 6 5}							
			MORNING		AFTERNOON		High Water MORNING		AFTERNOON		Low Water MORNING		AFTERNOON	
		H. M.	Time H.M.	Height F.I.	Time H.M.	Height F.I.	Time H.M.	Height F.I.	Time H.M.	Height F.I.	Time H.M.	Height F.I.	Time H.M.	Height F.I.
Tu.	1	8m 2	8 3	13 0	8 45	13 0	8 7	14 4	8 49	14 2	1 34	3 1	2 17	3 1
W.	2	8 54	9 25	13 1	10 4	13 3	9 32	14 4	10 12	14 7	3 2	3 0	3 46	2 11
Th.	3	9 44	10 38	13 6	11 8	13 9	10 48	14 11	11 18	15 3	4 25	2 9	4 59	2 7
F.	4	10 32	11 34	14 1	11 57	14 4	11 43	15 7	—	—	5 30	2 4	5 58	2 1
S.	5	11 18	—		0 18	14 7	0 4	15 11	0 24	16 3	6 22	1 11	6 44	1 9
S.	6	on 2	0 37	14 10	0 56	15 0	0 43	16 7	1 2	16 10	7 4	1 8	7 23	1 7
M.	7	0 44	1 13	15 2	1 29	15 4	1 19	17 1	1 35	17 3	7 41	1 5	7 58	1 3
Tu.	8	1 25	1 45	15 6	2 0	15 6	1 51	17 5	2 6	17 6	8 14	1 1	8 30	1 0
W.	9	2 6	2 15	15 7	2 30	15 7	2 21	17 6	2 35	17 5	8 44	0 11	8 57	0 11
Th.	10	2 47	2 44	15 6	2 58	15 6	2 49	17 5	3 3	17 4	9 10	0 11	9 22	1 0
F.	11	3 30	3 13	15 5	3 28	15 4	3 18	17 3	3 34	17 1	9 35	1 1	9 48	1 3
S.	12	4 15	3 44	15 2	4 0	15 0	3 50	16 11	4 6	16 9	10 1	1 5	10 14	1 6
S.	13	5 3	4 18	14 9	4 36	14 5	4 22	16 6	4 40	16 2	10 28	1 8	10 44	1 11
M.	14	5 55	4 56	14 1	5 17	13 9	4 59	15 9	5 20	15 4	11 2	2 3	11 22	2 8
Tu.	15	6 50	5 42	13 6	6 11	13 3	5 44	15 0	6 13	14 8	11 45	3 2	—	
W.	16	7 49	6 45	13 0	7 26	12 11	6 49	14 6	7 30	14 5	0 14	3 6	0 52	3 7
Th.	17	8 50	8 11	13 0	8 55	13 3	8 14	14 4	8 59	14 6	1 38	3 4	2 25	3 0
F.	18	9 50	9 37	13 8	10 16	14 1	9 44	15 0	10 25	15 7	3 14	2 8	4 0	2 3
S.	19	10 49	10 49	14 7	11 19	15 1	10 59	16 3	11 28	16 11	4 39	1 10	5 13	1 4
S.	20	11 46	11 46	15 7	—		11 53	17 6	—		5 44	0 10	6 12	0 5
M.	21	m.	0 11	16 1	0 35	16 7	0 17	18 1	0 41	18 8	6 38	0 8	7 2	*0 4
Tu.	22	0 40	0 58	16 11	1 21	17 2	1 5	19 1	1 28	19 4	7 26	*0 8	7 50	*0 11
W.	23	1 33	1 43	17 3	2 5	17 4	1 50	19 6	2 11	19 6	8 13	*1 1	8 34	*1 2
Th.	24	2 26	2 26	17 3	2 46	17 1	2 32	19 5	2 52	19 3	8 53	*1 1	9 12	*0 11
F.	25	3 18	3 6	16 11	3 26	16 7	3 12	19 0	3 32	18 7	9 30	*0 8	9 47	*0 3
S.	26	4 11	3 47	16 2	4 8	15 9	3 52	18 2	4 13	17 8	10 4	0 2	10 21	0 6
S.	27	5 4	4 30	15 2	4 52	14 8	4 34	17 1	4 55	16 5	10 39	1 0	10 58	1 7
M.	28	5 57	5 15	14 1	5 42	13 7	5 18	15 8	5 44	15 1	11 20	2 3	11 45	3 0
Tu.	29	6 49	6 13	13 2	6 49	12 8	6 16	14 7	6 53	14 2	—		0 16	3 7
W.	30	7 40	7 28	12 6	8 13	12 6	7 34	13 10	8 17	13 8	0 56	3 9	1 41	3 9
Th.	31	8 29	8 59	12 7	9 41	12 10	9 3	13 9	9 47	14 1	2 29	3 7	3 18	3 5

Half mean spring range.	8ft. 0in.	9ft. 1in.

Phases of the moon.

	D.	H.	M.	
New	6	11	48	Morning.
First Quarter	14	11	54	Morning.
Full	21	4	45	Morning.
Last Quarter	27	11	57	Afternoon.
In Apogee	6	10		Afternoon.
In Perigee	20	10		Afternoon.

Moon's declination at noon.

M.D.	° ′	M.D.	° ′	M.D.	° ′	M.D.	° ′
1	23 N.49	9	0 8.29	17	23 S. 1	25	15 N.53
2	23 39	10	5 17	18	20 42	26	19 35
3	22 22	11	9 56	19	16 56	27	22 8
4	20 5	12	14 15	20	12 0	28	23 29
5	16 58	13	18 3	21	6 18	29	23 37
6	13 11	14	21 5	22	0 15	30	22 37
7	8 54	15	23 5	23	5 N.42	31	20 36
8	4 18	16	23 48	24	11 10		

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for SHEERNESS *subtract* 3 m. | CHATHAM *subtract* 2 m.
* Below zero, or datum to which soundings on charts are reduced.

AUGUST, 1899.

Approximate — LONDON (London bridge): RISE 5 30, FALL 7 0.
Approximate — HARWICH (Angel quay): RISE 6 25, FALL 6 0.
Approximate — HULL (Victoria dock): RISE 5 40, FALL 6 30.

Week Day	M.D.	London Morn. Time	Ht.	London Aft. Time	Ht.	Harwich Morn. Time	Ht.	Harwich Aft. Time	Ht.	Hull Morn. Time	Ht.	Hull Aft. Time	Ht.	D
Tu.	1	9 16	17 3	9 57	17 2	7 10	9 8	7 53	9 8	1 41	16 2	2 18	16 1	24·6
W.	2	10 38	17 2	11 18	17 3	8 33	9 9	9 11	9 10	2 55	16 3	3 32	16 7	25·6
Th.	3	11 53	17 7	—		9 46	10 0	10 17	10 3	4 7	17 0	4 37	17 6	26·6
F.	4	0 25	18 0	0 53	18 4	10 45	10 5	11 19	10 7	5 3	17 11	5 25	18 4	27·6
S.	5	1 17	18 8	1 38	18 11	11 30	10 9	11 50	10 11	5 46	18 8	6 6	18 11	28·6
S.	6	1 58	19 2	2 16	19 4	—		0 9	11 0	6 25	19 2	6 43	19 5	●
M.	7	2 33	19 7	2 48	19 10	0 26	11 1	0 42	11 2	7 0	19 8	7 16	19 10	1·0
Tu.	8	3 3	20 0	3 18	20 1	0 58	11 3	1 14	11 3	7 32	20 0	7 47	20 1	2·0
W.	9	3 33	20 1	3 48	20 2	1 30	11 3	1 45	11 2	8 2	20 2	8 17	20 2	3·0
Th.	10	4 3	20 2	4 18	20 2	1 59	11 2	2 14	11 1	8 32	20 1	8 47	20 0	4·0
F.	11	4 33	20 1	4 48	19 11	2 29	11 0	2 45	10 11	9 3	19 9	9 19	19 6	5·0
S.	12	5 4	19 9	5 20	19 6	3 1	10 10	3 17	10 9	9 36	19 2	9 53	18 9	6·0
S.	13	5 37	19 2	5 55	18 10	3 34	10 7	3 52	10 5	10 11	18 4	10 31	17 11	7·0
M.	14	6 15	18 5	6 37	18 0	4 11	10 3	4 31	10 1	10 54	17 6	11 22	17 1	☽
Tu.	15	7 1	17 8	7 29	17 4	4 55	9 11	5 22	9 9	11 54	16 8	—		9·0
W.	16	8 2	17 1	8 41	17 2	5 54	9 8	6 32	9 7	0 30	16 3	1 8	16 2	10·0
Th.	17	9 25	17 3	10 10	17 5	7 17	9 8	8 3	9 10	1 47	16 2	2 27	16 6	11·0
F.	18	10 54	17 9	11 31	18 2	8 46	10 1	9 24	10 4	3 7	17 2	3 44	17 10	12·0
S.	19	—		0 5	18 10	9 58	10 8	10 29	11 0	4 18	18 8	4 48	19 5	13·0
S.	20	0 37	19 6	1 6	20 2	10 57	11 4	11 23	11 8	5 14	20 2	5 39	20 10	14·0
M.	21	1 31	20 8	1 55	21 1	11 48	11 11	—		6 4	21 5	6 28	21 11	○
Tu.	22	2 18	21 5	2 40	21 0	0 12	12 1	0 35	12 3	6 52	22 3	7 15	22 6	16·0
W.	23	3 2	22 0	3 24	22 0	0 57	12 3	1 19	12 3	7 37	22 7	7 59	22 7	17·0
Th.	24	3 45	22 0	4 6	21 10	1 41	12 2	2 2	12 0	8 20	22 7	8 41	22 1	18·0
F.	25	4 27	21 8	4 48	21 4	2 23	11 10	2 44	11 8	9 2	21 7	9 23	20 11	19·0
S.	26	5 8	20 11	5 27	20 3	3 5	11 5	3 26	11 2	9 44	20 3	10 5	19 6	20·0
S.	27	5 48	19 9	6 10	19 1	3 46	10 10	4 7	10 6	10 27	18 9	10 52	18 0	☾
M.	28	6 34	18 4	7 0	17 9	4 30	10 3	4 55	10 0	11 22	17 3	11 56	16 6	22·0
Tu.	29	7 30	17 3	8 4	16 10	5 24	9 9	5 56	9 6	—		0 32	15 11	23·0
W.	30	8 43	16 8	9 27	16 8	6 34	9 5	7 20	9 5	1 10	15 6	1 50	15 5	24·0
Th.	31	10 13	16 9	10 55	16 11	8 6	9 6	8 48	9 8	2 31	15 6	3 10	15 11	25·0

Half mean spring range: London 10ft. 4in.　Harwich 5ft. 9in.　Hull 10ft. 5in.

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	6	7	Sub.	9	5	20	Sub.	17	3	56	Sub.	25	1	59	Sub.
2	6	3		10	5	12		18	3	43		26	1	42	
3	5	59		11	5	2		19	3	29		27	1	25	
4	5	54		12	4	53		20	3	15		28	1	8	
5	5	48		13	4	42		21	3	1		29	0	50	
6	5	42		14	4	32		22	2	46		30	0	32	
7	5	35		15	4	20		23	2	31		31	0	14	
8	5	28		16	4	8		24	2	15					

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for LONDON 0 m.　|　HARWICH subtract 6 m.　|　HULL add 1 m.

AUGUST, 1899.

WEEK DAY.	MONTH DAY.	MOON'S TRANSIT. H. M.	SUNDERLAND (*North dock*). APPROXIMATE { RISE 6 5 / FALL 6 25 }				NORTH SHIELDS (*Low lighthouse*). APPROXIMATE { RISE 5 40 / FALL 6 45 }				LEITH (*East pier*). APPROXIMATE { RISE 6 0 / FALL 6 15 }			
			MORNING.		AFTERNOON.		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.	
			Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.
Tu.	1	8m 2	11 11	10 9	11 48	10 10	11 23	11 2	—	—	10 17	12 4	10 55	12 5
W.	2	8 54	—	—	0 24	11 0	0 1	11 3	0 37	11 4	11 31	12 6	—	—
Th.	3	9 44	0 57	11 3	1 27	11 7	1 10	11 6	1 38	11 9	0 4	12 9	0 32	13 1
F.	4	10 32	1 55	11 11	2 20	12 3	2 2	12 0	2 24	12 4	0 56	13 6	1 19	13 11
S.	5	11 18	2 42	12 6	3 2	12 9	2 45	12 8	3 3	13 0	1 40	14 3	2 0	14 7
S.	6	on 2	3 20	13 0	3 36	13 3	3 20	13 3	3 36	13 6	2 18	14 11	2 35	15 2
M.	7	0 44	3 52	13 5	4 7	13 7	3 52	13 8	4 8	13 10	2 50	15 4	3 5	15 6
Tu.	8	1 25	4 22	13 9	4 37	13 10	4 24	13 11	4 40	13 11	3 20	15 7	3 35	15 7
W.	9	2 6	4 52	13 11	5 7	13 10	4 55	13 11	5 10	13 10	3 50	15 7	4 5	15 6
Th.	10	2 47	5 22	13 9	5 38	13 7	5 25	13 9	5 41	13 8	4 20	15 5	4 36	15 4
F.	11	3 30	5 54	13 5	6 10	13 3	5 57	13 7	6 14	13 5	4 52	15 2	5 8	15 0
S.	12	4 15	6 27	13 0	6 46	12 8	6 31	13 3	6 49	13 0	5 25	14 10	5 44	14 6
S.	13	5 3	7 6	12 5	7 27	12 2	7 8	12 8	7 29	12 4	6 4	14 2	6 26	13 10
M.	14	5 55	7 49	11 10	8 14	11 6	7 53	12 0	8 20	11 8	6 49	13 5	7 14	13 1
Tu.	15	6 50	8 43	11 2	9 17	11 0	8 50	11 4	9 26	11 2	7 45	12 9	8 20	12 6
W.	16	7 49	9 56	10 10	10 38	10 11	10 8	11 1	10 51	11 2	9 0	12 5	9 43	12 6
Th.	17	8 50	11 20	11 1	mid.	11 6	11 33	11 5	—	—	10 26	12 8	11 8	13 1
F.	18	9 50	—	—	0 36	11 11	0 13	11 10	0 49	12 2	11 44	13 6	—	—
S.	19	10 49	1 9	12 6	1 40	13 1	1 20	12 8	1 48	13 3	0 14	14 1	0 42	14 9
S.	20	11 46	2 9	13 8	2 35	14 2	2 14	13 10	2 38	14 5	1 8	15 6	1 33	16 2
M.	21	m.	3 0	14 8	3 23	15 1	3 0	14 11	3 22	15 4	1 57	16 9	2 20	17 3
Tu.	22	0 40	3 45	15 5	4 7	15 8	3 44	15 8	4 6	15 10	2 42	17 6	3 3	17 8
W.	23	1 33	4 28	15 9	4 49	15 9	4 28	15 10	4 50	15 9	3 24	17 9	3 45	17 7
Th.	24	2 26	5 10	15 6	5 31	15 3	5 12	15 7	5 34	15 4	4 6	17 5	4 28	17 1
F.	25	3 18	5 52	14 10	6 14	14 4	5 56	14 11	6 18	14 6	4 50	16 9	5 12	16 3
S.	26	4 11	6 36	13 10	6 59	13 4	6 40	14 1	7 2	13 7	5 34	15 9	5 57	15 2
S.	27	5 4	7 23	12 9	7 48	12 2	7 25	13 0	7 51	12 5	6 21	14 6	6 46	13 10
M.	28	5 57	8 15	11 7	8 45	11 1	8 20	11 9	8 53	11 3	7 15	13 3	7 48	12 8
Tu.	29	6 49	9 20	10 8	9 59	10 4	9 31	10 10	10 12	10 8	8 24	12 2	9 4	11 11
W.	30	7 40	10 40	10 3	11 22	10 4	10 54	10 7	11 36	10 8	9 47	11 10	10 30	11 11
Th.	31	8 29	—	—	0 1	10 7	—	—	0 15	10 11	11 9	12 1	11 43	12 5

Half mean spring range }   Sunderland 7ft 2in.   North Shields 7ft 4in.   Leith 8ft 2in.

Phases of the moon.			
	D.	H.	M.
New - - -	6	11	48 Morning.
First Quarter -	14	11	54 Morning.
Full - - -	21	4	45 Morning.
Last Quarter -	27	11	57 Afternoon.
In Apogee - -	6	10	Afternoon.
In Perigee -	20	10	Afternoon.

Moon's declination at noon.

M.D.	o '	M.D.	o '	M.D.	o '	M.D.	o '
1	23 N.49	9	0 8.29	17	23 8. 1	25	15 N.53
2	23 39	10	5 17	18	20 42	26	19 35
3	22 22	11	9 56	19	16 56	27	22 8
4	20 5	12	14 15	20	12 0	28	23 29
5	16 58	13	18 3	21	6 18	29	23 37
6	13 11	14	21 5	22	0 15	30	22 37
7	8 54	15	23 5	23	5 N.42	31	20 36
8	4 18	16	23 48	24	11 0		

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for SUNDERLAND *add* 5 m. | NORTH SHIELDS *add* 6 m. | LEITH *add* 13 m.

AUGUST, 1899.

Week Day	Month Day	THURSO (near Scrabster pier) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	GREENOCK (East dock) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	LIVERPOOL (George pier) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	D's Age at Noon
		APPROXIMATE { RISE 6 30 / FALL 0 0 }				APPROXIMATE { RISE 6 30 / FALL 6 0 }				APPROXIMATE { RISE 5 35 / FALL 6 50 }				
Tu	1	4 15	9 2	4 56	9 1	7 19	8 1	7 59	8 1	6 46	20 7	7 28	20 8	24·6
W.	2	5 33	9 2	6 6	9 5	8 38	8 2	9 15	8 3	8 7	20 9	8 42	21 9	25·6
Th.	3	6 34	9 10	6 56	10 3	9 47	8 5	10 15	8 7	9 11	21 9	9 36	23 0	26·6
F.	4	7 16	10 9	7 35	11 2	10 39	8 8	11 2	8 9	9 59	22 9	10 19	24 3	27·6
S.	5	7 52	11 7	8 8	11 11	11 23	8 11	11 43	9 0	10 38	23 9	10 56	25 0	28·6
S.	6	8 23	12 2	8 38	12 4	—	—	0 2	9 1	11 14	24 8	11 31	25 8	●
M.	7	8 53	12 5	9 8	12 6	0 20	9 3	0 37	9 4	11 48	25 3	—		1·0
T.	8	9 23	12 7	9 38	12 7	0 53	9 5	1 9	9 5	0 4	26 4	0 20	25 8	2·0
W.	9	9 54	12 6	10 10	12 5	1 24	9 6	1 39	9 6	0 35	26 6	0 50	25 8	3·0
Th.	10	10 26	12 3	10 42	12 1	1 54	9 6	2 9	9 6	1 5	26 5	1 20	25 5	4·0
F.	11	10 59	11 11	11 17	11 8	2 24	9 5	2 40	9 5	1 35	25 9	1 50	24 8	5·0
S.	12	11 36	11 4	11 56	11 0	2 56	9 4	3 12	9 2	2 6	24 9	2 22	23 9	6·0
S.	13	—	—	0 17	10 8	3 28	9 1	3 48	9 0	2 40	23 10	2 59	22 11	7·0
M.	14	0 40	10 4	1 6	10 0	4 9	8 10	4 32	8 8	3 20	22 6	3 44	22 1	☽
Tu.	15	1 36	9 8	2 12	9 5	4 58	8 6	5 28	8 4	4 12	21 1	4 46	20 11	9·0
W.	16	2 54	9 4	3 40	9 4	6 4	8 3	6 46	8 2	5 26	20 1	6 12	20 11	10·0
Th.	17	4 26	9 6	5 8	9 9	7 29	8 3	8 12	8 5	6 58	20 6	7 42	22 2	11·0
F.	18	5 45	10 2	6 16	10 10	8 52	8 7	9 28	8 10	8 21	21 10	8 54	24 0	12·0
S.	19	6 43	11 7	7 6	12 4	10 0	9 2	10 28	9 5	9 22	23 10	9 47	26 3	13·0
S.	20	7 27	13 1	7 48	13 9	10 55	9 8	11 21	9 10	10 12	26 2	10 36	28 2	14·0
M.	21	8 9	14 3	8 30	14 6	11 47	10 0	—		11 0	27 6	11 24	29 5	○
Tu.	22	8 51	14 8	9 13	14 9	0 12	10 2	0 36	10 4	11 47	28 7	—		16·0
W.	23	9 35	14 8	9 57	14 5	0 59	10 5	1 21	10 5	0 9	30 3	0 31	28 10	17·0
Th.	24	10 19	14 1	10 41	13 8	1 42	10 4	2 3	10 3	0 53	30 0	1 14	28 1	18·0
F.	25	11 3	13 2	11 25	12 7	2 24	10 2	2 44	10 0	1 34	28 5	1 54	26 7	19·0
S.	26	11 48	12 0	—		3 4	9 9	3 24	9 6	2 14	26 6	2 34	24 11	20·0
S.	27	0 12	11 4	0 38	10 8	3 45	9 3	4 7	9 0	2 55	24 7	3 18	22 11	☾
M.	28	1 7	10 2	1 39	9 8	4 31	8 9	4 59	8 6	3 44	22 2	4 13	20 11	22·0
Tu.	29	2 15	9 2	2 56	8 10	5 31	8 3	6 7	8 0	4 48	20 2	5 28	19 8	23·0
W.	30	3 43	8 9	4 30	8 8	6 49	7 10	7 32	7 10	6 14	19 5	7 0	20 2	24·0
Th.	31	5 11	8 9	5 45	9 0	8 13	7 11	8 51	8 1	7 43	19 10	8 20	21 1	25·0
Half mean spring range }		6ft. 7in.				4ft. 10in.				13ft. 9in.				

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	6	7	Sub.	9	5	20	Sub.	17	3	56	Sub.	25	1	59	Sub.
2	6	3		10	5	12		18	3	43		26	1	42	
3	5	59		11	5	2		19	3	29		27	1	25	
4	5	54		12	4	53		20	3	15		28	1	8	
5	5	48		13	4	42		21	3	1		29	0	50	
6	5	42		14	4	32		22	2	46		30	0	32	
7	5	35		15	4	20		23	2	31		31	0	14	
8	5	28		16	4	8		24	2	15					

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for THURSO *add* 14 m. | GREENOCK *add* 19 m. | LIVERPOOL *add* 12 m.

AUGUST, 1899.

Week Day	Month Day	Moon's Transit	Pembroke (H.M. Dockyard). Approximate { Rise 6 10 / Fall 0 20				Portishead (Dock entr.). Approximate { Rise 5 10 / Fall 0 40				Holyhead (Pier). Approximate { Rise 6 20 / Fall 6 0			
			Morning		Afternoon		Morning		Afternoon		Morning		Afternoon	
		H. M.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.
Tu.	1	8m 2	1 1	16 7	1 45	16 7	2 1	31 3	2 45	31 4	5 51	12 5	6 29	12 6
W.	2	8 54	2 28	16 10	3 7	17 3	3 29	31 11	4 11	32 9	7 5	12 8	7 38	12 11
Th.	3	9 44	3 42	17 10	4 12	18 5	4 47	33 9	5 17	34 10	8 7	13 2	8 32	13 6
F.	4	10 32	4 39	19 0	5 4	19 6	5 43	35 9	6 7	36 8	8 54	13 10	9 14	14 2
S.	5	11 18	5 27	19 11	5 48	20 3	6 29	37 5	6 49	38 0	9 33	14 5	9 51	14 8
S.	6	on 2	6 6	20 7	6 23	20 11	7 6	38 9	7 23	39 5	10 8	14 11	10 23	15 1
M.	7	0 44	6 39	21 7	6 55	21 5	7 39	39 10	7 54	40 2	10 37	15 3	10 51	15 4
Tu.	8	1 25	7 10	21 7	7 24	21 8	8 9	40 4	8 24	40 5	11 5	15 5	11 19	15 5
W.	9	2 6	7 39	21 7	7 54	21 6	8 39	40 3	8 54	40 2	11 34	15 4	11 50	15 5
Th.	10	2 47	8 9	21 5	8 25	21 3	9 9	40 0	9 23	39 9	—	—	0 7	15 3
F.	11	3 30	8 41	21 0	8 57	20 8	9 37	39 5	9 51	38 11	0 24	15 0	0 41	14 11
S.	12	4 15	9 14	20 3	9 31	19 9	10 6	38 5	10 23	37 5	0 59	14 8	1 18	14 5
S.	13	5 3	9 49	19 3	10 8	18 9	10 40	36 7	10 58	35 7	1 38	14 1	1 59	13 9
M.	14	5 55	10 28	18 3	10 51	17 8	11 18	34 5	11 40	33 3	2 22	13 5	2 47	13 1
Tu.	15	6 50	11 18	17 2	11 50	16 11	—	—	0 8	32 4	3 16	12 9	3 52	12 6
W.	16	7 49	—	—	0 28	16 10	0 44	31 8	1 27	31 8	4 35	12 5	5 19	12 6
Th.	17	8 50	1 12	17 0	2 0	17 7	2 13	32 1	3 0	33 2	6 0	12 9	6 40	13 2
F.	18	9 50	2 44	18 3	3 23	19 3	3 46	34 7	4 27	36 4	7 17	13 7	7 49	14 0
S.	19	10 49	3 59	20 3	4 30	21 3	5 3	38 3	5 33	39 11	8 18	14 8	8 44	15 3
S.	20	11 46	4 58	22 2	5 25	23 0	6 1	41 6	6 27	43 1	9 8	15 10	9 31	16 4
M.	21	m.	5 51	23 8	6 15	24 2	6 52	44 3	7 16	45 2	9 54	16 9	10 15	17 0
Tu.	22	0 40	6 38	24 6	7 0	24 7	7 38	45 8	8 0	45 10	10 36	17 3	10 56	17 4
W.	23	1 33	7 21	24 7	7 42	24 5	8 21	45 8	8 42	45 4	11 17	17 3	11 38	17 2
Th.	24	2 26	8 3	24 0	8 24	23 5	9 2	44 9	9 22	43 10	—	—	noon	16 10
F.	25	3 18	8 45	22 10	9 5	22 1	9 41	42 9	9 59	41 5	0 22	16 6	0 44	16 0
S.	26	4 11	9 25	21 2	9 45	20 3	10 17	39 11	10 36	38 4	1 7	15 8	1 30	14 11
S.	27	5 4	10 5	19 4	10 27	18 6	10 56	36 8	11 17	34 9	1 54	14 4	2 19	13 9
M.	28	5 57	10 51	17 6	11 18	16 8	11 41	33 0	—	—	2 47	13 2	3 19	12 8
Tu.	29	6 49	11 50	16 1	—	—	0 10	31 4	0 46	30 2	3 56	12 3	4 37	12 0
W.	30	7 40	0 30	15 10	1 16	15 10	1 30	29 10	2 16	29 11	5 22	11 11	6 4	12 0
Th.	31	8 29	2 2	16 1	2 43	16 8	3 2	30 6	3 45	31 4	6 43	12 3	7 17	12 6

Half mean spring range.	Pembroke 11ft 3in.	Portishead 21ft 0in.	Holyhead 8ft 0in.

Phases of the moon.

	D. H. M.	
New	6 11 48	Morning.
First Quarter	14 11 54	Morning.
Full	21 4 45	Morning.
Last Quarter	27 11 57	Afternoon.
In Apogee	6 10	Afternoon.
In Perigee	20 10	Afternoon.

Moon's declination at noon.

M.D.	° '	M.D.	° '	M.D.	° '	M.D.	° '
1	23 N.49	9	0 N.29	17	23 S. 1	25	15 N.53
2	23 39	10	5 17	18	20 42	26	19 35
3	22 22	11	9 56	19	16 56	27	22 8
4	20 5	12	14 15	20	12 0	28	23 29
5	16 58	13	18 3	21	6 18	29	23 37
6	13 11	14	21 5	22	0 15	30	22 37
7	8 54	15	23 5	23	5 N.42	31	20 36
8	4 18	16	23 48	24	11 10		

AUGUST, 1899.

WEEK DAY	MONTH DAY	KINGSTOWN (Watering pier) MORNING Time H.M.	Height F.L.	AFTERNOON Time H.M.	Height F.L.	BELFAST (New dock) MORNING Time H.M.	Height F.L.	AFTERNOON Time H.M.	Height F.L.	LONDONDERRY (Ship bridge) MORNING Time H.M.	Height F.L.	AFTERNOON Time H.M.	Height F.L.	AGE & NOON D.
Tu.	1	6 39	8 9	7 16	8 10	6 21	7 11	7 0	7 11	3 56	5 9	4 30	5 11	24·6
W.	2	7 52	8 11	8 27	9 1	7 38	8 0	8 12	8 1	5 1	6 0	5 28	6 1	25·6
Th.	3	8 59	9 3	9 28	9 5	8 41	8 3	9 6	8 5	5 53	6 2	6 16	6 4	26·6
F.	4	9 53	9 8	10 14	9 10	9 29	8 7	9 50	8 9	6 39	6 6	7 1	6 8	27·6
S.	5	10 32	10 0	10 49	10 2	10 9	8 11	10 26	9 0	7 22	6 10	7 41	6 11	28·6
S.	6	11 5	10 4	11 21	10 5	10 43	9 1	10 59	9 1	7 58	7 1	8 13	7 2	●
M.	7	11 36	10 6	11 51	10 6	11 15	9 2	11 30	9 2	8 28	7 3	8 42	7 4	1·0
Tu.	8	—	—	0 6	10 7	11 44	9 2	11 58	9 3	8 56	7 5	9 10	7 4	2·0
W.	9	0 22	10 7	0 38	10 6	—	—	0 14	9 3	9 24	7 3	9 38	7 2	3·0
Th.	10	0 54	10 6	1 10	10 5	0 30	9 3	0 46	9 2	9 52	7 1	10 7	7 0	4·0
F.	11	1 26	10 4	1 43	10 2	1 2	9 2	1 20	9 1	10 23	6 11	10 39	6 9	5·0
S.	12	2 0	10 0	2 18	9 10	1 38	9 0	1 58	8 11	10 57	6 7	11 17	6 5	6·0
S.	13	2 37	9 8	2 58	9 6	2 19	8 9	2 41	8 7	11 42	6 2	—	—	7·0
M.	14	3 20	9 4	3 45	9 2	3 4	8 5	3 29	8 4	0 11	5 11	0 43	5 8	◗
Tu.	15	4 15	9 0	4 50	8 10	3 58	8 3	4 31	8 2	1 20	5 7	2 2	5 6	9·0
W.	16	5 28	8 9	6 8	8 10	5 9	8 1	5 49	8 2	2 45	5 7	3 26	5 9	10·0
Th.	17	6 48	9 0	7 28	9 3	6 31	8 0	7 13	8 2	4 5	6 0	4 40	6 3	11·0
F.	18	8 5	9 6	8 40	9 10	7 51	8 4	8 24	8 7	5 10	6 6	5 36	6 9	12·0
S.	19	9 12	10 2	9 42	10 6	8 52	8 11	9 18	9 2	6 2	7 1	6 28	7 5	13·0
S.	20	10 7	10 10	10 29	11 2	9 43	9 8	10 7	9 8	6 54	7 8	7 19	7 11	14·0
M.	21	10 51	11 5	11 13	11 7	10 30	9 10	10 52	9 11	7 43	8 2	8 5	8 4	○
Tu.	22	11 35	11 9	11 57	11 9	11 13	10 0	11 34	10 0	8 26	8 6	8 46	8 6	16·0
W.	23	—	—	0 19	11 8	11 55	9 11	—	—	9 6	8 8	9 26	8 3	17·0
Th.	24	0 41	11 7	1 3	11 5	0 17	9 11	0 39	9 10	9 46	8 1	10 6	7 10	18·0
F.	25	1 25	11 2	1 47	10 10	1 1	9 8	1 24	9 6	10 26	7 7	10 47	7 3	19·0
S.	26	2 9	10 6	2 31	10 3	1 47	9 4	2 11	9 1	11 10	6 11	11 37	6 6	20·0
S.	27	2 54	9 11	3 18	9 7	2 36	8 10	3 2	8 7	—	—	0 9	6 1	☾
M.	28	3 45	9 3	4 17	8 11	3 30	8 4	4 1	8 2	0 45	5 9	1 24	5 6	22·0
Tu.	29	4 52	8 8	5 29	8 5	4 35	8 0	5 11	7 10	2 6	5 4	2 48	5 3	23·0
W.	30	6 10	8 5	6 51	8 6	5 52	7 10	6 34	7 9	3 30	5 5	4 8	5 7	24·0
Th.	31	7 30	8 8	8 5	8 11	7 15	7 10	7 51	7 11	4 42	5 9	5 11	5 11	25·0

Half mean spring range: Kingstown 5 ft. 6 in. — Belfast 4 ft. 9 in. — Londonderry 3 ft. 10 in.

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	6	7	Sub.	9	5	20	Sub.	17	3	56	Sub.	25	1	59	Sub.
2	6	3		10	5	12		18	3	43		26	1	42	
3	5	59		11	5	2		19	3	29		27	1	25	
4	5	54		12	4	53		20	3	15		28	1	8	
5	5	48		13	4	42		21	3	1		29	0	50	
6	5	42		14	4	32		22	2	46		30	0	32	
7	5	35		15	4	20		23	2	31		31	0	14	
8	5	28		16	4	8		24	2	15					

The times of high water are given for Mean time at place; if Dublin or Railway time be required,— for KINGSTOWN *subtract* 1 m. for Dublin time. | BELFAST *subtract* 2 m. | LONDONDERRY *add* 4 m.

AUGUST, 1899.

Week Day	Month Day	Moon's Transit H. M.	SLIGO BAY (Mullaghmore.) Morning Time H.M.	Morning Height F.I.	Afternoon Time H.M.	Afternoon Height F.I.	GALWAY (Nimmo pier). Morning Time H.M.	Morning Height F.I.	Afternoon Time H.M.	Afternoon Height F.I.	QUEENSTOWN (Scott's wharf). Morning Time H.M.	Morning Height F.I.	Afternoon Time H.M.	Afternoon Height F.I.
Tu.	1	8m 2	0 55	8 2	1 34	8 3	0 6	10 8	0 46	10 8	0 5	8 11	0 45	8 11
W.	2	8 54	2 11	8 4	2 44	8 6	1 23	10 10	1 56	11 1	1 25	9 0	2 3	9 2
Th.	3	9 44	3 12	8 9	3 36	9 1	2 25	11 5	2 51	11 9	2 38	9 5	3 7	9 8
F.	4	10 32	3 56	9 5	4 16	9 8	3 15	12 1	3 36	12 5	3 33	9 11	3 56	10 8
S.	5	11 18	4 35	9 11	4 54	10 2	3 55	12 9	4 14	13 1	4 17	10 5	4 36	10 8
S.	6	0a 2	5 12	10 4	5 29	10 6	4 32	13 5	4 48	13 8	4 54	10 10	5 12	11 0
M.	7	0 44	5 44	10 8	5 59	10 9	5 4	13 10	5 19	14 0	5 29	11 2	5 45	11 3
Tu.	8	1 25	6 14	10 9	6 29	10 8	5 34	14 1	5 49	14 2	6 1	11 3	6 16	11 4
W.	9	2 6	6 44	10 8	6 59	10 7	6 4	14 2	6 20	14 1	6 31	11 4	6 46	11 4
Th.	10	2 47	7 15	10 5	7 31	10 3	6 36	14 0	6 52	13 10	7 1	11 3	7 17	11 2
F.	11	3 30	7 47	10 1	8 3	9 10	7 8	13 7	7 25	13 4	7 33	11 0	7 49	10 10
S.	12	4 15	8 20	9 7	8 39	9 4	7 43	13 0	8 2	12 8	8 5	10 7	8 22	10 5
S.	13	5 3	9 0	9 1	9 25	8 10	8 23	12 3	8 45	11 10	8 39	10 2	8 58	9 10
M.	14	5 55	9 53	8 7	10 25	8 4	9 9	11 5	9 37	11 0	9 20	9 7	9 44	9 4
Tu.	15	6 50	11 1	8 2	11 41	8 2	10 10	11 0	10 50	10 8	10 14	9 2	10 50	9 0
W.	16	7 49	—	—	0 23	8 3	11 33	10 9	—	—	11 31	9 0	—	—
Th.	17	8 50	1 5	8 5	1 46	8 8	0 17	11 0	0 58	11 4	0 15	9 2	1 0	9 5
F.	18	9 50	2 23	9 0	2 54	9 6	1 35	11 10	2 7	12 6	1 41	9 8	2 19	10 1
S.	19	10 49	3 22	10 0	3 46	10 6	2 36	13 2	3 4	13 10	2 52	10 7	3 22	11 1
S.	20	11 46	4 10	11 0	4 34	11 6	3 29	14 6	3 53	15 1	3 50	11 7	4 16	12 0
M.	21	m.	4 58	11 10	5 21	12 1	4 16	15 7	4 38	16 0	4 40	12 4	5 4	12 7
Tu.	22	0 40	5 43	12 3	6 4	12 4	5 0	16 3	5 22	16 5	5 28	12 9	5 51	12 9
W.	23	1 33	6 25	12 2	6 46	12 0	5 44	16 5	6 6	16 3	6 13	12 10	6 34	12 9
Th.	24	2 26	7 7	11 9	7 28	11 5	6 28	15 11	6 50	15 6	6 55	12 6	7 16	12 3
F.	25	3 18	7 49	11 0	8 10	10 6	7 12	15 0	7 33	14 5	7 36	11 11	7 56	11 6
S.	26	4 11	8 32	10 0	8 56	9 6	7 55	13 9	8 18	13 0	8 16	11 1	8 36	10 8
S.	27	5 4	9 23	9 1	9 53	8 8	8 43	12 3	9 10	11 6	8 57	10 2	9 19	9 8
M.	28	5 57	10 28	8 4	11 6	8 0	9 39	10 11	10 14	10 5	9 44	9 3	10 8	8 11
Tu.	29	6 49	11 46	7 10	—	—	10 54	10 1	11 36	10 5	10 51	8 8	11 34	8 6
W.	30	7 40	0 27	7 9	1 9	7 10	—	—	0 19	10 1	—	—	0 18	8 6
Th.	31	8 29	1 49	8 0	2 24	8 3	1 0	10 4	1 36	10 8	1 1	8 8	1 40	8 11

Approximate — Sligo Bay: { Rise 0 10, Fall 0 20 }   Galway: { Rise 6 30, Fall 0 0 }   Queenstown: { Rise 6 5, Fall 6 25 }

Half mean spring range }   Sligo Bay 5ft. 7in.   Galway 7ft. 5in.   Queenstown 5ft. 10in.

Phases of the moon.

	D.	H.	M.	
New	6	11	48	Morning.
First Quarter	14	11	54	Morning.
Full	21	4	45	Morning.
Last Quarter	27	11	57	Afternoon.
In Apogee	6	10		Afternoon.
In Perigee	20	10		Afternoon.

Moon's declination at noon.

M.D.	o '	M.D.	o '	M.D.	o '	M.D.	o '
1	23 N.49	9	0 S.29	17	23 S.1	25	15 N.53
2	23 39	10	5 17	18	20 42	26	19 35
3	22 22	11	9 56	19	16 56	27	22 8
4	20 5	12	14 15	20	12 0	28	23 29
5	16 58	13	18 3	21	6 18	29	23 37
6	13 11	14	21 5	22	0 S.42	30	22 37
7	8 54	15	23 5	23	5 N.42	31	20 36
8	4 18	16	23 48	24	11 10		

AUGUST, 1899.

WEEK DAY.	MONTH DAY.	WATERFORD (*Duncannon fort*). APPROXIMATE { RISE H.6 M.5 / FALL 6 20 }															☾'s AGE AT NOON.
		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.					
		Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.				D.
Tu.	1	0 19	9 8	0 57	9 8	·											24·6
W.	2	1 35	9 9	2 13	9 11												25·6
Th.	3	2 50	10 2	3 22	10 5												26·6
F.	4	3 49	10 8	4 14	10 11												27·6
S.	5	+ 37	11 2	+ 58	11 4												28·6
S.	6	5 17	11 6	5 34	11 8												●
M.	7	5 50	11 9	6 6	11 10												1·0
Tu.	8	6 22	11 11	6 37	12 0												2·0
W.	9	6 52	12 0	7 7	12 1												3·0
Th.	10	7 22	12 0	7 37	11 11												4·0
F.	11	7 52	11 10	8 8	11 9												5·0
S.	12	8 2+	11 7	8 40	11 4												6·0
S.	13	8 57	11 1	9 14	10 11												7·0
M.	14	9 34	10 8	10 0	10 4												D
Tu.	15	10 33	10 1	11 10	9 10												9·0
W.	16	11 49	9 9	—	—												10·0
Th.	17	0 29	9 10	1 10	10 1												11·0
F.	18	1 50	10 5	2 29	10 11												12·0
S.	19	3 6	11 5	3 40	11 10												13·0
S.	20	4 10	12 4	4 37	12 9												14·0
M.	21	5 2	13 0	5 26	13 2												○
Tu.	22	5 49	13 4	6 11	13 6												16·0
W.	23	6 33	13 6	6 55	13 5												17·0
Th.	24	7 16	13 4	7 37	13 1												18·0
F.	25	7 57	12 10	8 16	12 5												19·0
S.	26	8 34	12 1	8 53	11 8												20·0
S.	27	9 13	11 2	9 34	10 9												☾
M.	28	10 2	10 3	10 35	9 10												22·0
Tu.	29	11 11	9 6	11 51	9 3												23·0
W.	30	—	—	0 32	9 3												24·0
Th.	31	1 12	9 5	1 50	9 8												25·0

Half mean spring range. } 6ft. 2in.

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	6	7	Sub.	9	5	20	Sub.	17	3	56	Sub.	25	1	59	Sub.
2	6	3		10	5	12		18	3	43		26	1	42	
3	5	59		11	5	2		19	3	29		27	1	25	
4	5	54		12	4	53		20	3	15		28	1	8	
5	5	48		13	4	42		21	3	1		29	0	50	
6	5	42		14	4	32		22	2	46		30	0	32	
7	5	35		15	4	20		23	2	31		31	0	14	
8	5	28		16	4	8		24	2	15					

The times of high water are given for Mean time at place; if Dublin or Railway time be required,—for WATERFORD *add* 3 m.

F

†SEPTEMBER, 1899.

Week Day	Month Day	Moon's Transit	BREST (Entr. of Dockyard basin) Approximate RISE 6 10 / FALL 6 20 Morning Time	Morning Height F. L.	Afternoon Time	Afternoon Height F. L.	DEVONPORT (H.M. Dockyard) High Water Approximate RISE 6 0 / FALL 6 10 Morning Time	Morning Height F. L.	Afternoon Time	Afternoon Height F. L.	Low Water Morning Time	Morning Height F. L.	Afternoon Time	Afternoon Height F. L.
		H. M.	H. M.		H. M.		H. M.		H. M.		H. M.		H. M.	
F.	1	9m16	1 12	14 0	1 40	14 8	2 30	11 10	3 5	13 1	8 46	4 5	9 23	3 1
S.	2	10 0	2 2	15 4	2 21	16 0	3 35	12 8	4 1	13 11	9 54	3 5	10 19	2 1
S.	3	10 43	2 39	16 7	2 56	17 2	4 24	13 5	4 45	14 6	10 40	2 6	11 0	1 3
M.	4	11 24	3 12	17 8	3 28	18 1	5 4	13 11	5 22	15 0	11 19	1 9	11 37	0 8
Tu.	5	oa 5	3 43	18 4	3 58	18 6	5 39	14 6	5 55	15 3	11 54	1 1	—	
W.	6	0 47	4 13	18 8	4 28	18 9	6 11	14 10	6 26	15 5	0 10	0 3	0 25	0 7
Th.	7	1 29	4 43	18 10	4 58	18 9	6 41	15 0	6 55	15 3	0 40	0 1	0 55	0 6
F.	8	2 13	5 13	18 7	5 27	18 4	7 9	14 10	7 23	14 10	1 10	0 4	1 24	0 9
S.	9	3 0	5 42	18 1	5 58	17 9	7 37	14 8	7 52	14 5	1 38	0 9	1 52	1 2
S.	10	3 50	6 16	17 3	6 35	16 9	8 7	14 2	8 23	13 10	2 7	1 4	2 22	1 9
M.	11	4 43	6 56	16 2	7 19	15 6	8 40	13 9	8 59	13 3	2 38	2 1	2 54	2 6
Tu.	12	5 39	7 44	14 10	8 13	14 3	9 20	13 3	9 43	12 6	3 12	3 1	3 32	3 3
W.	13	6 37	8 46	13 9	9 25	13 6	10 11	12 9	10 45	11 11	3 54	3 11	4 22	3 11
Th.	14	7 36	10 10	13 7	10 58	13 11	11 26	12 5	—		4 59	4 9	5 42	4 5
F.	15	8 33	11 45	14 5	—		0 12	11 10	1 12	10 10	6 28	4 11	7 15	3 10
S.	16	9 29	0 26	15 3	1 0	16 1	1 48	12 6	2 30	13 11	8 2	3 10	8 47	2 4
S.	17	10 24	1 30	17 1	1 56	18 1	3 8	13 8	3 39	15 2	9 27	2 6	9 58	0 11
M.	18	11 18	2 19	19 0	2 41	19 10	4 8	14 9	4 34	16 0	10 25	1 3	10 50 *0 11	
Tu.	19	m.	3 3	20 6	3 25	20 10	5 0	15 8	5 24	16 8	11 14	0 0	11 38 *1 1	
W.	20	0 11	3 47	21 1	4 9	21 0	5 47	16 3	6 9	17 0	—		0 2 *0 10	
Th.	21	1 4	4 30	20 11	4 50	20 8	6 31	16 5	6 51	16 0	0 25 *1 6		0 46 *1 0	
F.	22	1 58	5 10	20 3	5 30	19 8	7 11	16 2	7 30	16 0	1 6 *1 1		1 26 *0 1	
S.	23	2 53	5 50	19 1	6 10	18 4	7 48	15 8	8 6	15 2	1 46 *0 4		2 4	0 2
S.	24	3 47	6 30	17 5	6 51	16 8	8 23	14 10	8 40	14 1	2 21	0 8	2 38	1 2
M.	25	4 41	7 14	15 11	7 39	14 8	8 58	13 11	9 18	13 0	2 55	2 0	3 12	2 0
Tu.	26	5 34	8 7	13 10	8 38	13 2	9 40	12 11	10 4	11 11	3 30	3 5	3 50	3 2
W.	27	6 24	9 15	12 8	9 57	12 6	10 34	12 0	11 9	11 1	4 15	4 9	4 48	4 8
Th.	28	7 12	10 41	12 6	11 23	12 9	11 50	11 9	—		5 27	5 9	6 7	5 0
F.	29	7 57	—		0 1	13 2	0 33	11 1	1 15	12 2	6 47	5 9	7 28	4 4
S.	30	8 40	0 34	13 9	1 3	14 4	1 55	11 8	2 30	13 0	8 9	4 8	8 47	3 3

Half mean spring range	9 ft. 6 in.	7 ft. 9 in.

Phases of the moon.

		H. M.	
New	- 5	3 33	Morning.
First Quarter	- 12	9 49	Afternoon.
Full	- 19	0 31	Afternoon.
Last Quarter	- 26	3 3	Afternoon.
In Apogee	- 3	1	Morning.
In Perigee	- 18	7	Morning.
In Apogee	- 30	0	Noon.

Moon's declination at noon.

M.D.	o '	M.D.	o '	M.D.	o '	M.D.	o '
1	17 N.43	9	17 S. 1	17	8 s.49	25	23 N.26
2	14 8	10	20 12	18	2 59	26	22 46
3	10 0	11	22 26	19	3 N. 0	27	21 2
4	5 30	12	23 29	20	8 45	28	18 23
5	0 46	13	23 12	21	13 52	29	15 0
6	4 S. 2	14	21 29	22	18 4	30	11 2
7	8 43	15	18 23	23	21 7		
8	13 14	16	14 4	24	22 55		

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for BREST add 18 m.   DEVONPORT add 17 m.
* Below zero, or datum to which soundings on charts are reduced.
† See last paragraph, Tides on the East Coast of England, p. 149.

SEPTEMBER, 1899.

PORTSMOUTH (H.M. Dockyard). High Water — Approximate { Rise 7 20 / Fall 5 10 } H.M.

DOVER (North pier). High Water — Approximate { Rise 5 0 / Fall 7 30 } H.M.

Week Day	Month Day	Portsmouth H.W. Morning Time (H.M.)	Height (F.I.)	Afternoon Time (H.M.)	Height (F.I.)	Low Water Morning Time (H.M.)	Height (F.I.)	Afternoon Time (H.M.)	Height (F.I.)	Dover H.W. Morning Time (H.M.)	Height (F.I.)	Afternoon Time (H.M.)	Height (F.I.)	D. Age at Noon
F.	1	9 3	10 11	9 32	11 3	1 53	3 4	2 21	2 10	8 28	14 10	8 55	15 4	26·0
S.	2	9 56	11 7	10 17	11 11	2 45	2 5	3 6	2 0	9 19	15 10	9 39	16 3	27·0
S.	3	10 35	12 2	10 52	12 5	3 24	1 7	3 41	1 3	9 59	16 8	10 18	17 1	28·0
M.	4	11 8	12 8	11 24	12 11	3 58	1 0	4 14	0 9	10 36	17 6	10 53	17 9	29·0
Tu.	5	11 39	13 1	11 54	13 2	4 29	0 7	4 44	0 5	11 10	18 0	11 26	18 2	●
W.	6	—	—	0 9	13 3	4 58	0 4	5 12	0 3	11 42	18 4	11 58	18 5	1·3
Th.	7	0 25	13 4	0 41	13 3	5 26	0 2	5 40	0 3	—	—	0 14	18 6	2·3
F.	8	0 57	13 2	1 13	13 1	5 55	0 4	6 10	0 5	0 31	18 5	0 48	18 4	3·3
S.	9	1 29	13 0	1 44	12 11	6 25	0 6	6 41	0 9	1 5	18 3	1 22	18 0	4·3
S.	10	2 0	12 9	2 17	12 6	6 57	1 1	7 13	1 5	1 39	17 9	1 57	17 6	5·3
M.	11	2 36	12 3	2 57	11 11	7 31	1 9	7 52	2 2	2 17	17 1	2 38	16 8	6·3
Tu.	12	3 19	11 8	3 42	11 5	8 16	2 7	8 44	3 0	3 0	16 2	3 23	15 8	☽
W.	13	4 8	11 1	4 40	10 10	9 18	3 5	9 58	3 9	3 49	15 2	4 19	14 8	8·3
Th.	14	5 18	10 7	6 2	10 6	10 43	3 10	11 32	3 9	4 53	14 4	5 33	14 3	9·3
F.	15	6 48	10 8	7 33	11 0	—	—	0 21	3 6	6 15	14 6	6 58	15 1	10·3
S.	16	8 15	11 6	8 51	12 0	1 5	3 0	1 40	2 4	7 39	15 9	8 15	16 6	11·3
S.	17	9 22	12 6	9 50	13 1	2 8	1 8	2 34	1 1	8 45	17 3	9 13	18 0	12·3
M.	18	10 15	13 6	10 38	13 10	2 58	0 6	3 21	0 0	9 39	18 8	10 3	19 3	13·3
Tu.	19	11 0	14 2	11 21	14 5	3 43	*0 5	4 5	*0 8	10 27	19 9	10 51	20 0	○
W.	20	11 43	14 6	—	—	4 26	*0 11	4 47	*1 1	11 15	20 2	11 39	20 3	15·3
Th.	21	0 5	14 7	0 27	14 5	5 8	*1 1	5 28	*1 0	—	—	0 1	20 2	16·3
F.	22	0 48	14 3	1 9	14 0	5 48	*0 10	6 8	*0 7	0 23	20 0	0 45	19 9	17·3
S.	23	1 30	13 9	1 51	13 5	6 28	*0 3	6 47	0 3	1 7	19 4	1 29	18 10	18·3
S.	24	2 11	13 1	2 31	12 7	7 6	0 10	7 26	1 5	1 51	18 4	2 12	17 7	19·3
M.	25	2 51	12 2	3 13	11 8	7 47	1 11	8 12	2 6	2 33	16 11	2 55	16 3	20·3
Tu.	26	3 37	11 3	4 4	10 10	8 41	3 2	9 14	3 8	3 18	15 6	3 44	14 10	☾
W.	27	4 34	10 5	5 9	10 2	9 52	4 1	10 34	4 3	4 13	14 2	4 45	13 8	22·3
Th.	28	5 49	10 0	6 30	9 11	11 19	4 4	—	—	5 20	13 5	5 58	13 5	23·3
F.	29	7 11	10 1	7 50	10 5	0 4	4 3	0 45	4 0	6 37	13 8	7 16	14 1	24·3
S.	30	8 25	10 9	8 55	11 1	1 20	3 7	1 48	3 1	7 50	14 7	8 19	15 1	25·3

Half mean spring range.	6ft. 9in.	9ft. 4in.

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	0	5	Add.	9	2	43	Add.	17	5	31	Add.	25	8	20	Add.
2	0	24		10	3	4		18	5	53		26	8	40	
3	0	43		11	3	24		19	6	14		27	9	1	
4	1	3		12	3	45		20	6	35		28	9	21	
5	1	22		13	4	6		21	6	56		29	9	41	
6	1	42		14	4	28		22	7	18		30	10	0	
7	2	2		15	4	49		23	7	38					
8	2	23		16	5	10		24	7	59					

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for PORTSMOUTH add 4 m. | DOVER subtract 5 m.
* Below zero, or datum to which soundings on charts are reduced.

SEPTEMBER, 1899.

Week Day	Month Day	Moon's Transit	SHEERNESS (H.M. Dockyard). APPROXIMATE {RISE 6 5, FALL 6 25} Morning Time	Height	Afternoon Time	Height	CHATHAM (H.M. Dockyard). High Water. Morning Time	Height	Afternoon Time	Height	APPROXIMATE {RISE 6 35, FALL 6 5} Low Water. Morning Time	Height	Afternoon Time	Height
F.	1	9m16	10 17	13 2	10 47	13 6	10 25	14 6	10 57	15 0	4 1	3 2	4 38	2 1
S.	2	10 0	11 13	13 11	11 35	14 3	11 25	15 5	11 44	15 10	5 9	2 7	5 36	2 3
S.	3	10 43	11 54	14 6	—	—	—	—	0 1	16 2	6 0	1 11	6 20	1 8
M.	4	11 24	0 12	14 10	0 2..	11	0 18	16 7	0 35	16 11	6 39	1 6	6 56	1 4
Tu.	5	0a 5	0 45	15 4	.. 15	7	0 51	17 3	1 7	17 6	7 13	1 2	7 29	1 0
W.	6	0 47	1 16	15 9	1 31	15 10	1 22	17 8	1 37	17 10	7 44	0 10	7 59	0 8
Th.	7	1 29	1 45	15 11	1 59	15 11	1 51	18 0	2 5	17 11	8 14	0 6	8 28	0 6
F.	8	2 13	2 13	15 10	2 28	15 10	2 19	17 10	2 33	17 9	8 42	0 6	8 55	0 7
S.	9	3 0	2 43	15 9	2 58	15 8	2 48	17 7	3 3	17 5	9 8	0 9	9 21	0 11
S.	10	3 50	3 13	15 6	3 29	15 3	3 19	17 3	3 36	17 0	9 34	1 1	9 47	1 4
M.	11	4 43	3 46	15 0	4 5	14 8	3 53	16 9	4 11	16 5	10 1	1 6	10 17	1 9
Tu.	12	5 39	4 26	14 3	4 49	13 11	4 31	16 0	4 52	15 6	10 35	2 1	10 55	2 5
W.	13	6 37	5 15	13 7	5 45	13 3	5 17	15 1	5 47	14 9	11 18	2 11	11 48	3 5
Th.	14	7 36	6 21	13 0	7 3	12 10	6 24	14 5	7 8	14 4	—	—	0 26	3 8
F.	15	8 33	7 51	13 0	8 39	13 3	7 55	14 4	8 43	14 4	1 13	3 5	2 4	3 4
S.	16	9 29	9 24	13 9	10 3	14 3	9 30	15 1	10 11	15 9	2 56	2 7	3 44	2 0
S.	17	10 24	10 35	14 9	11 4	15 4	10 45	16 5	11 12	17 1	4 24	1 8	4 57	1 1
M.	18	11 18	11 29	15 10	11 52	16 4	11 36	17 9	11 58	18 4	5 26	0 7	5 53	0 1
Tu.	19	m.	—	—	0 14	16 9	0 20	18 10			6 18	*0 1	6 41	*0 7
W.	20	0 11	0 36	17 0	0 58	17 3	0 42	19 3	1 4	19 6	7 4	*0 10	7 26	*1 1
Th.	21	1 4	1 20	17 4	1 41	17 4	1 26	19 8	1 47	19 7	7 48	*1 2	8 10	*1 2
F.	22	1 58	2 1	17 2	2 21	17 2	2 7	19 2	2 27	19 2	8 30	*1 0	8 48	*0 10
S.	23	2 53	2 40	16 9	2 59	16 5	2 47	18 10	3 6	18 4	9 5	*0 6	9 22	*0 1
S.	24	3 47	3 19	16 0	3 39	15 7	3 26	18 0	3 46	17 6	9 39	0 4	9 55	0 10
M.	25	4 41	4 0	15 1	4 22	14 8	4 6	16 11	4 26	16 3	10 11	1 4	10 29	1 10
Tu.	26	5 34	4 45	14 0	5 11	13 6	4 48	15 6	5 13	14 11	10 50	2 4	11 14	3 1
W.	27	6 24	5 41	13 0	6 16	12 8	5 43	14 5	6 18	14 0	11 44	3 9	—	—
Th.	28	7 12	6 55	12 5	7 38	12 6	6 58	13 9	7 42	13 7	0 22	4 1	1 5	4 1
F.	29	7 57	8 22	12 5	9 2	12 8	8 26	13 7	9 8	13 10	1 52	3 11	2 39	3 8
S.	30	8 40	9 40	13 0	10 12	13 4	9 47	14 3	10 21	14 9	3 23	3 4	4 1	3 0

Half mean spring range } Sheerness 8ft. 0in.   Chatham 9ft. 1in.

Phases of the moon.

	D.	H.	M.	
New - - -	5	3	33	Morning.
First Quarter	12	9	49	Afternoon.
Full - - -	19	0	31	Afternoon.
Last Quarter -	26	3	3	Afternoon.
In Apogee - -	3	1		Morning.
In Perigee -	18	7		Morning.
In Apogee -	30	0		Noon.

Moon's declination at noon.

M.D.	°	′	M.D.	°	′	M.D.	°	′	M.D.	°	′
1	17 N.43		9	17 S. 1		17	8 S.49		25	23 N.26	
2	14	8	10	20	12	18	2	59	26	22	46
3	10	0	11	22	26	19	3 N. 0		27	21	2
4	5	30	12	23	29	20	8	45	28	18	23
5	0	4	13	23	22	21	13	52	29	15	0
6	4 S.	8	14	21	29	22	18	4	30	11	1
7	8	43	15	18	23	23	21	7			
8	13	7	16	14	4	24	22	55			

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Week Day	Month Day	London Morn. Time H.M.	Morn. Ht. F.L.	London Aft. Time H.M.	Aft. Ht. F.L.	Harwich Morn. Time H.M.	Morn. Ht. F.I.	Harwich Aft. Time H.M.	Aft. Ht. F.I.	Hull Morn. Time H.M.	Morn. Ht. F.L.	Hull Aft. Time H.M.	Aft. Ht. F.I.	D's Age at Noon
		LONDON (*London bridge*). APPROXIMATE { RISE 5 30 / FALL 7 0				HARWICH (*Angel quay*). APPROXIMATE { RISE 6 25 / FALL 6 0				HULL (*Victoria dock*). APPROXIMATE { RISE 5 40 / FALL 6 30				D.
F.	1	11 31	17 2	—		9 24	9 10	9 55	10 1	3 45	16 6	4 16	17 1	26·0
S.	2	0 3	17 8	0 32	18 1	10 23	10 4	10 46	10 7	4 43	17 8	5 5	18 2	27·0
S.	3	0 56	18 6	1 15	18 11	11 5	10 9	11 24	10 11	5 23	18 7	5 41	19 0	28·0
M.	4	1 33	19 3	1 50	19 6	11 42	11 1	11 58	11 3	5 58	19 4	6 15	19 8	29·0
Tu.	5	2 6	19 9	2 21	20 0	—		0 14	11 4	6 31	19 11	6 46	20 2	●
W.	6	2 35	20 2	2 49	20 4	0 29	11 5	0 43	11 5	7 1	20 5	7 16	20 6	1·3
Th.	7	3 3	20 5	3 17	20 6	0 57	11 6	1 12	11 6	7 31	20 7	7 46	20 7	2·3
F.	8	3 32	20 6	3 47	20 5	1 27	11 5	1 42	11 4	8 1	20 6	8 16	20 5	3·3
S.	9	4 2	20 4	4 18	20 3	1 58	11 3	2 14	11 2	8 31	20 3	8 47	20 0	4·3
S.	10	4 34	20 1	4 50	19 10	2 30	11 1	2 46	11 0	9 4	19 7	9 22	19 2	5·3
M.	11	5 8	19 6	5 27	19 2	3 4	10 9	3 23	10 6	9 41	18 8	10 2	18 2	6·3
Tu.	12	5 48	18 8	6 10	18 3	3 43	10 4	4 5	10 2	10 25	17 9	10 53	17 3	☽
W.	13	6 34	17 10	7 3	17 5	4 29	10 0	4 57	9 10	11 26	16 9	—		8·3
Th.	14	7 37	17 1	8 18	17 0	5 30	9 8	6 10	9 7	0 5	16 3	0 47	16 1	9·3
F.	15	9 5	17 2	9 53	17 6	6 58	9 8	7 46	9 10	1 30	16 2	2 12	16 0	10·3
S.	16	10 38	17 10	11 18	18 4	8 31	10 1	9 10	10 5	2 53	17 2	3 31	18 0	11·3
S.	17	11 53	19 0	—		9 43	10 9	10 13	11 1	4 4	18 10	4 33	19 8	12·3
M.	18	0 22	19 9	0 49	20 4	10 40	11 5	11 4	11 9	4 58	20 5	5 21	21 1	13·3
Tu.	19	1 12	20 10	1 34	21 3	11 27	12 0	11 49	12 2	5 44	21 8	6 7	22 1	O
W.	20	1 56	21 7	2 17	21 10	—		0 10	12 3	6 29	22 5	6 51	22 7	15·3
Th.	21	2 38	22 1	2 59	22 1	0 31	12 4	0 52	12 3	7 13	22 7	7 34	22 5	16·3
F.	22	3 20	21 11	3 41	21 9	1 13	12 2	1 34	12 0	7 54	22 3	8 14	21 11	17·3
S.	23	4 1	21 6	4 21	21 2	1 55	11 10	2 16	11 7	8 34	21 5	8 54	20 10	18·3
S.	24	4 41	20 9	5 0	20 3	2 37	11 4	2 58	11 1	9 14	20 1	9 35	19 3	19·3
M.	25	5 20	19 7	5 41	18 11	3 18	10 9	3 38	10 6	9 57	18 6	10 21	17 9	20·3
Tu.	26	6 5	18 3	6 30	17 7	4 0	10 2	4 24	9 11	10 50	17 0	11 23	16 4	☾
W.	27	6 58	17 4	7 31	16 8	4 52	9 8	5 24	9 5	—		noon. 15		22·3
Th.	28	8 9	16 6	8 52	16 6	6 1	9 4	6 45	9 3	0 39	15 4	1 18	15 3	23·3
F.	29	9 36	16 7	10 17	16 9	7 30	9 4	8 10	9 6	1 56	15 3	2 33	15 5	24·3
S.	30	10 54	17 0	11 27	17 4	8 47	9 8	9 19	9 11	3 8	16 2	3 40	16 9	25·3

Half mean spring range }	10ft. 4in.	5ft. 9in.	10ft. 5in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	0 5	Add.	9	2 43	Add.	17	5 31	Add.	25	8 20	Add.
2	0 24		10	3 4		18	5 53		26	8 40	
3	0 43		11	3 24		19	6 14		27	9 1	
4	1 3		12	3 45		20	6 35		28	9 21	
5	1 22		13	4 6		21	6 56		29	9 41	
6	1 42		14	4 28		22	7 18		30	10 0	
7	2 2		15	4 49		23	7 38				
8	2 23		16	5 10		24	7 59				

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for LONDON 0 m. | HARWICH *subtract* 5 m. | HULL *add* 1 m.

SEPTEMBER, 1899.

Week Day	Month Day	Moon's Transit H. M.	SUNDERLAND (North dock). Approximate Rise 0 5 / Fall 6 25 Morning Time H.M.	Morning Height F.I.	Afternoon Time H.M.	Afternoon Height F.I.	NORTH SHIELDS (Low lighthouse). Approximate Rise 5 40 / Fall 6 45 Morning Time H.M.	Morning Height F.I.	Afternoon Time H.M.	Afternoon Height F.I.	LEITH (East pier). Approximate Rise 0 0 / Fall 6 15 Morning Time H.M.	Morning Height F.I.	Afternoon Time H.M.	Afternoon Height F.I.
F.	1	9m16	0 36	10 11	1 6	11 4	0 49	11 2	1 18	11 6	—		0 13	12 9
S.	2	10 0	1 33	11 9	1 57	12 1	1 43	11 10	2 4	12 3	0 38	13 2	0 58	13 8
S.	3	10 43	2 17	12 6	2 36	12 10	2 22	12 7	2 39	13 0	1 17	14 2	1 35	14 7
M.	4	11 24	2 54	13 1	3 10	13 4	2 55	13 4	3 10	13 7	1 52	15 0	2 8	15 4
Tu.	5	0a 5	3 25	13 7	3 39	13 10	3 25	13 10	3 39	14 1	2 23	15 7	2 37	15 10
W.	6	0 47	3 53	14 0	4 7	14 2	3 53	14 3	4 8	14 4	2 51	15 11	3 5	16 0
Th.	7	1 29	4 22	14 3	4 37	14 4	4 23	14 5	4 38	14 4	3 19	16 1	3 33	16 0
F.	8	2 13	4 52	14 2	5 7	14 0	4 54	14 2	5 10	14 2	3 48	15 11	4 15	15 9
S.	9	3 0	5 22	13 10	5 38	13 7	5 26	13 10	5 42	13 8	4 20	15 7	4 37	15 4
S.	10	3 50	5 55	13 3	6 14	13 0	5 59	13 6	6 17	13 3	4 54	15 1	5 12	14 10
M.	11	4 43	6 35	12 8	6 58	12 4	6 37	12 11	6 59	12 7	5 32	14 6	5 55	14 1
Tu.	12	5 39	7 22	12 0	7 47	11 7	7 23	12 3	7 51	11 10	6 20	13 8	6 47	13 3
W.	13	6 37	8 16	11 3	8 52	11 0	8 24	11 5	9 3	11 1	7 18	12 10	7 56	12 6
Th.	14	7 36	9 34	10 10	10 36	10 3	9 47	11 0	10 32	11 2	8 39	12 4	9 25	12 5
F.	15	8 33	11 5	11 1	11 46	11 6	11 17	11 6	mid.	11 11	10 11	12 9	10 53	13 2
S.	16	9 29			0 22	12 1			0 36	12 4	11 29	13 8	mid.	14 4
S.	17	10 24	0 54	12 9	1 23	13 4	1 6	12 11	1 33	13 5	—		0 26	15 0
M.	18	11 18	1 51	13 11	2 16	14 5	1 57	14 0	2 19	14 7	0 51	15 8	1 15	16 4
Tu.	19	m.	2 38	14 11	3 0	15 2	2 39	15 1	3 0	15 6	1 37	16 11	1 59	17 4
W.	20	0 11	3 21	15 6	3 42	15 8	3 21	15 9	3 42	15 11	2 20	17 8	2 40	17 10
Th.	21	1 4	4 3	15 6	4 24	15 8	4 3	15 11	4 24	15 9	3 0	17	3 20	17 0
F.	22	1 58	4 44	15 5	5 4	15 2	4 45	15 6	5 6	15 9	3 40	17 4	4 1	17 0
S.	23	2 53	5 24	14 8	5 45	14 2	5 27	14 9	5 49	14 4	4 22	16 7	4 43	16 1
S.	24	3 47	6 7	13 8	6 29	13 2	6 11	13 11	6 33	13 4	5 5	15 7	5 27	15 0
M.	25	4 41	6 52	12 6	7 16	12 0	6 55	12 10	7 20	12 3	5 50	14 4	6 15	13 8
Tu.	26	5 34	7 43	11 6	8 13	11 0	7 48	11 8	8 19	11 1	6 43	13 1	7 15	12 6
W.	27	6 24	8 47	10 7	9 26	10 3	8 56	10 6	9 38	10 6	7 51	12 1	8 31	11 9
Th.	28	7 12	10 7	10 2	10 48	10 2	11 0	10 5	11 0	10 6	9 13	11 8	9 54	11 9
F.	29	7 57	11 27	10 4			11 39	10 9	—		10 33	11 11	11 8	12 3
S.	30	8 40	0 10	10 0	0 31	11 1	0 15	11 1	0 45	11 5	11 38	12 7		

Half mean spring range.	7ft. 2in.	7ft. 4in.	8ft. 2in.

Phases of the moon.			
	D.	H.	M.
New	5	3	33 Morning.
First Quarter	12	9	49 Afternoon.
Full	19	0	31 Afternoon.
Last Quarter	26	3	3 Afternoon.
In Apogee		3	1 Morning.
In Perigee		18	7 Morning.
In Apogee		30	0 Noon.

Moon's declination at noon.

M.D.	o	'	M.D.	o	'	M.D.	o	'	M.D.	o	'
1	17 N.43		9	17 S. 1		17	8 S. 49		25	23 N.26	
2	14	8	10	20	12	18	2	59	26	22	46
3	10	0	11	22	26	19	3 N. 0		27	21	2
4	5	30	12	23	29	20	8	45	28	18	23
5	0	46	13	23	12	21	13	52	29	15	0
6	4 S. 2		14	21	29	22	18	4	30	11	2
7	8	43	15	18	23	23	21	7			
8	13	7	16	14	4	24	22	55			

SEPTEMBER, 1899.

Port headings:

- **THURSO** (*Near Scrabster pier*). APPROXIMATE — { RISE 6 30 / FALL 6 0 }
- **GREENOCK** (*East dock*). APPROXIMATE — { RISE 6 30 / FALL 6 0 }
- **LIVERPOOL** (*George pier*). APPROXIMATE — { RISE 5 35 / FALL 6 50 }

Week Day	Month Day	THURSO Morning Time H.M.	Height F.I.	THURSO Afternoon Time H.M.	Height F.I.	GREENOCK Morning Time H.M.	Height F.I.	GREENOCK Afternoon Time H.M.	Height F.I.	LIVERPOOL Morning Time H.M.	Height F.I.	LIVERPOOL Afternoon Time H.M.	Height F.I.	D's Age at Noon
F.	1	6 14	9 6	6 38	10 0	9 25	8 3	9 53	8 6	8 50	21 0	9 16	22 3	26·0
S.	2	6 57	10 6	7 14	11 0	10 17	8 8	10 37	8 10	9 38	22 6	9 56	22 9	27·0
S.	3	7 29	11 6	7 43	11 11	10 56	8 11	11 15	9 0	10 13	23 10	10 30	24 11	28·0
M.	4	7 57	12 4	8 11	12 7	11 33	9 2	11 50	9 4	10 47	24 8	11 3	26 0	29·0
Tu.	5	8 25	12 10	8 39	12 11	—	—	0 6	9 5	11 19	25 6	11 34	26 9	●
W.	6	8 53	13 0	9 7	13 1	0 22	9 6	0 38	9 7	11 49	26 3	—	—	1·3
Th.	7	9 22	13 0	9 38	12 11	0 54	9 8	1 9	9 9	0 4	27 4	0 19	26 4	2·3
F.	8	9 54	12 9	10 10	12 6	1 24	9 8	1 39	9 9	0 34	26 11	0 49	26 1	3·3
S.	9	10 27	12 3	10 44	12 0	1 54	9 7	2 9	9 6	1 4	26 3	1 20	25 5	4·3
S.	10	11 3	11 8	11 24	11 3	2 25	9 5	2 42	9 4	1 36	25 3	1 53	24 5	5·3
M.	11	11 47	10 10	—	—	3 0	9 2	3 20	9 0	2 11	23 10	2 31	23 3	6·3
Tu.	12	0 11	10 5	0 38	10 1	3 42	8 10	4 6	8 9	2 53	22 5	3 17	22 1	☽
W.	13	1 9	9 9	1 47	9 6	4 33	8 7	5 5	8 5	3 45	20 11	4 20	20 11	8·3
Th.	14	2 31	9 4	3 20	9 4	5 43	8 3	6 27	8 2	5 3	19 8	5 52	20 9	9·3
F.	15	4 10	9 6	4 54	9 10	7 13	8 3	7 58	8 5	6 41	20 3	7 27	22 2	10·3
S.	16	5 31	10 4	6 2	11 0	8 38	8 8	9 13	9 0	8 7	22 2	8 39	24 3	11·3
S.	17	6 27	11 9	6 50	12 6	9 43	9 3	10 9	9 6	9 7	24 3	9 31	26 10	12·3
M.	18	7 10	13 3	7 30	13 11	10 36	9 9	11 0	9 11	9 54	26 6	10 16	28 8	13·3
Tu.	19	7 49	14 4	8 8	14 8	11 24	10 1	11 47	10 3	10 38	27 9	11 0	29 10	○
W.	20	8 28	14 9	8 48	14 8	—	—	0 10	10 4	11 22	28 10	11 44	30 4	15·3
Th.	21	9 8	14 6	9 29	14 4	0 33	10 5	0 55	10 4	—	—	0 6	28 11	16·3
F.	22	9 50	14 0	10 12	13 6	1 16	10 3	1 36	10 2	0 26	29 0	0 46	28 3	17·3
S.	23	10 34	13 0	10 56	12 5	1 56	10 0	2 16	9 10	1 6	28 1	1 26	26 9	18·3
S.	24	11 19	11 9	11 42	11 2	2 36	9 7	2 56	9 4	1 46	26 1	2 6	24 10	19·3
M.	25	—	—	0 7	10 6	3 16	9 1	3 37	8 11	2 27	23 9	2 48	22 7	20·3
Tu.	26	0 34	9 11	1 4	9 5	4 1	8 8	4 28	8 5	3 12	21 7	3 40	20 9	☾
W.	27	1 41	9 0	2 23	8 8	4 59	8 2	5 35	8 0	4 15	19 8	4 55	19 7	22·3
Th.	28	3 8	8 7	3 52	8 6	6 15	7 10	6 56	7 9	5 39	19 0	6 24	19 7	23·3
F.	29	4 33	8 8	5 9	8 11	7 36	7 10	8 14	8 0	7 5	19 7	7 43	20 4	24·3
S.	30	5 40	9 3	6 6	9 9	8 47	8 2	9 17	8 2	8 16	20 11	8 43	21 11	25·3

Half mean spring range: THURSO **6ft. 7in.** — GREENOCK **4ft. 10in.** — LIVERPOOL **13ft. 9in.**

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	0	5	Add.	9	2	43	Add.	17	5	31	Add.	25	8	20	Add.
2	0	24		10	3	4		18	5	53		26	8	40	
3	0	43		11	3	24		19	6	14		27	9	1	
4	1	3		12	3	45		20	6	35		28	9	21	
5	1	22		13	4	6		21	6	56		29	9	41	
6	1	42		14	4	28		22	7	18		30	10	0	
7	2	2		15	4	49		23	7	38					
8	2	23		16	5	10		24	7	59					

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for THURSO add 14 m. | GREENOCK add 19 m. | LIVERPOOL add 12 m.

SEPTEMBER, 1899.

WEEK DAY.	MONTH DAY.	MOON'S TRANSIT.	PEMBROKE (H.M. Dockyard). APPROXIMATE { RISE 6 10 / FALL 6 20				PORTISHEAD (Dock entr.). APPROXIMATE { RISE 5 40 / FALL 6 40				HOLYHEAD (Pier). APPROXIMATE { RISE 6 20 / FALL 6 0			
			MORNING.		AFTERNOON.		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.	
			Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.
F.	1	9m16	3 19	17 4	3 49	18 0	4 23	32 10	4 53	34 1	7 46	12 11	8 12	13 4
S.	2	10 0	4 1	18 8	4 38	19 4	5 19	35 4	5 42	36 5	8 34	13 9	8 52	14 1
S.	3	10 43	4 59	19 11	5 19	20 5	6 2	37 4	6 21	38 3	9 9	14 5	9 25	14 9
M.	4	11 24	5 37	20 11	5 54	21 4	6 39	39 2	6 55	39 11	9 41	15 0	9 56	15 3
Tu.	5	0a 5	6 10	21 7	6 24	21 10	7 10	40 7	7 25	41 0	10 10	15 6	10 24	15 8
W.	6	0 47	6 39	22 1	6 54	22 2	7 40	41 4	7 55	41 6	10 38	15 9	10 52	15 10
Th.	7	1 29	7 9	22 3	7 24	22 1	8 9	41 4	8 23	41 1	11 6	15 9	11 20	15 8
F.	8	2 13	7 39	21 11	7 54	21 9	8 37	40 10	8 51	40 7	11 35	15 7	11 51	15 5
S.	9	3 0	8 10	21 5	8 26	21 1	9 6	40 2	9 22	39 7	—		0 8	15 3
S.	10	3 50	8 44	20 8	9 3	20 2	9 38	38 10	9 55	38 0	0 26	15 0	0 46	14 8
M.	11	4 43	9 22	19 6	9 42	19 0	10 13	37 0	10 33	36 1	1 7	14 4	1 29	13 11
Tu.	12	5 39	10 3	18 5	10 27	17 10	10 54	34 11	11 17	33 6	1 53	13 7	2 19	13 2
W.	13	6 37	10 55	17 2	11 29	16 10	11 46	32 5	—		2 50	12 10	3 28	12 6
Th.	14	7 36	—		0 10	16 10	0 23	31 7	1 8	31 6	4 12	12 5	5 0	11 9
F.	15	8 33	0 56	17 1	1 44	17 8	1 56	32 2	2 45	33 4	5 12	12 10	6 26	13 3
S.	16	9 29	2 28	18 6	3 7	19 6	3 31	35 0	4 11	36 10	7 3	13 8	7 34	14 3
S.	17	10 24	3 41	20 7	4 11	21 7	4 45	38 9	5 15	40 7	8 2	14 11	8 27	15 6
M.	18	11 18	4 38	22 6	5 4	23 3	5 41	42 1	6 5	43 6	8 49	16 0	9 10	16 4
Tu.	19	m.	5 29	23 10	5 52	24 3	6 29	44 6	6 52	45 5	9 31	16 11	9 52	17 2
W.	20	0 11	6 14	24 6	6 36	24 7	7 14	45 11	7 35	45 10	10 11	17 3	10 32	17 4
Th.	21	1 4	6 56	24 5	7 16	24 2	7 56	45 6	8 16	44 11	10 52	17 2	11 12	17 0
F.	22	1 58	7 36	23 9	7 56	23 2	8 35	44 2	8 54	43 3	11 32	16 8	11 53	16 4
S.	23	2 53	8 16	22 6	8 36	21 10	9 13	42 2	9 32	40 10	—		0 15	15 11
S.	24	3 47	8 56	20 10	9 16	19 11	9 51	39 3	10 9	37 9	0 38	15 4	1 1	14 9
M.	25	4 41	9 37	19 1	9 59	18 3	10 28	36 2	10 49	34 6	1 24	14 2	1 48	13 7
Tu.	26	5 34	10 22	17 5	10 49	16 6	11 12	32 8	11 41	31 3	2 15	13 1	2 46	12 7
W.	27	6 24	11 21	15 11	11 57	15 9	—		0 15	30 0	3 22	12 2	4 4	11 10
Th.	28	7 12	—		0 37	15 8	0 55	29 6	1 38	29 7	4 47	11 9	5 28	11 10
F.	29	7 57	1 21	15 10	2 3	16 4	2 22	30 0	3 3	31 0	6 12	12 1	6 42	12 4
S.	30	8 40	2 40	17 0	3 11	17 8	3 41	32 3	4 15	33 6	7 12	12 9	7 38	13 1
	Half mean spring range.		11ft. 3in.				21ft. 0in.				8ft. 0in.			

Phases of the moon.					Moon's declination at noon.								
	D.	H.	M.		M.D.	° '	M.D.	° '	M.D.	° '	M.D.	° '	
New - - -	5	3	33	Morning.	1	17 N.43	9	17 S. 1	17	8 S.49	25	23 N.26	
First Quarter -	12	9	49	Afternoon.	2	14 8	10	20 12	18	2 59	26	22 46	
Full - - -	19	0	31	Afternoon.	3	10 6	11	22 26	19	3 N. 0	27	21 2	
Last Quarter -	26	3	3	Afternoon.	4	5 30	12	23 29	20	8 45	28	18 23	
					5	0 46	13	23 12	21	13 52	29	15 0	
In Apogee - -	3	1		Morning.	6	4 S. 2	14	21 29	22	18 4	30	11 2	
In Perigee -	18	7		Morning.	7	8 43	15	18 23	23	21 7			
In Apogee - -	30	0		Noon.	8	13 7	16	14 4	24	22 55			

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for PEMBROKE add 20 m.   PORTISHEAD add 11 m.   HOLYHEAD add 18 m.

SEPTEMBER, 1899.

Week Day	Month Day	KINGSTOWN (Watering pier) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	BELFAST (New Dock) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	LONDONDERRY (Ship Bridge) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	☽'s AGE at NOON D.
		Rise 6 15 / Fall 6 0				Rise 6 20 / Fall 6 0				Rise 6 15 / Fall 6 15				
F.	1	8 37	9 1	9 5	9 4	8 21	8 1	8 46	8 3	5 36	6 1	5 57	6 3	26·0
S.	2	9 30	9 7	9 51	9 9	9 8	8 6	9 27	8 8	6 17	6 6	6 36	6 8	27·0
S.	3	10 8	10 0	10 25	10 2	9 44	8 10	10 1	9 0	6 55	6 10	7 13	7 0	28·0
M.	4	10 40	10 4	10 54	10 6	10 17	9 2	10 32	9 3	7 30	7 2	7 46	7 4	29·0
Tu.	5	11 8	10 8	11 22	10 9	10 46	9 3	11 0	9 4	8 0	7 5	8 14	7 6	●
W.	6	11 36	10 10	11 51	10 10	11 14	9 4	11 28	9 5	8 27	7 7	8 40	7 7	1·3
Th.	7	—	—	0 6	10 9	11 43	9 4	11 58	9 4	8 54	7 6	9 8	7 5	2·3
F.	8	0 22	10 9	0 38	10 8	—	—	0 14	9 3	9 22	7 4	9 37	7 3	3·3
S.	9	0 54	10 7	1 11	10 5	0 30	9 3	0 47	9 2	9 52	7 1	10 8	6 11	4·3
S.	10	1 28	10 3	1 46	10 1	1 5	9 1	1 24	9 0	10 25	6 9	10 45	6 6	5·3
M.	11	2 7	9 10	2 29	9 7	1 46	8 10	2 10	8 8	11 10	6 3	11 39	6 0	6·3
Tu.	12	2 52	9 5	3 18	9 3	2 35	8 6	3 2	8 4	—	—	0 12	5 9	☽
W.	13	3 49	9 1	4 26	8 10	3 32	8 3	4 7	8 2	0 50	5 6	1 35	5 8	8·3
Th.	14	5 7	8 9	5 51	8 10	4 48	8 1	5 32	8 0	2 23	5 5	3 9	5 8	9·3
F.	15	6 33	9 0	7 14	9 3	6 16	8 1	6 58	8 2	3 50	6 0	4 27	6 4	10·3
S.	16	7 51	9 7	8 25	9 11	7 36	8 4	8 8	8 8	4 58	6 8	5 22	6 11	11·3
S.	17	8 56	10 3	9 24	10 7	8 35	9 0	9 0	9 3	5 46	7 2	6 10	7 6	12·3
M.	18	9 48	10 11	10 9	11	9 23	9 6	9 45	9 9	6 34	7 10	6 58	8 1	13·3
Tu.	19	10 30	11 6	10 50	11 8	10 7	9 10	10 28	9 11	7 21	8 3	7 43	8 5	○
W.	20	11 11	11 9	11 32	11 9	10 49	10 0	11 10	10 0	8 3	8 6	8 23	8 6	15·3
Th.	21	11 53	11 8	—	—	11 30	9 11	11 52	9 10	8 42	8 5	9 1	8 3	16·3
F.	22	0 14	11 6	0 35	11 4	—	—	0 11	9 9	9 20	8 0	9 39	7 9	17·3
S.	23	0 56	11 1	1 18	10 10	0 32	9 8	0 54	9 6	9 58	7 6	10 19	7 2	18·3
S.	24	1 40	10 6	2 2	10 3	1 17	9 3	1 40	9 0	10 41	6 10	11 5	6 5	19·3
M.	25	2 24	9 9	2 48	9 6	2 4	8 9	2 30	8 6	11 34	6 0	—	—	20·3
Tu.	26	3 14	9 2	3 44	8 10	2 57	8 4	3 27	8 2	0 9	5 8	0 47	5 5	☾
W.	27	4 20	8 7	4 59	8 5	4 2	8 0	4 40	7 10	1 30	5 3	2 14	5 2	22·3
Th.	28	5 38	8 4	6 16	8 5	5 19	7 9	5 58	7 8	2 56	5 3	3 35	5 5	23·3
F.	29	6 54	8 7	7 29	8 9	6 37	7 9	7 14	7 10	4 10	5 7	4 40	5 10	24·3
S.	30	8 0	9 0	8 28	9 3	7 46	8 0	8 12	8 2	5 5	6 0	5 26	6 2	25·3

Half mean spring range.	Kingstown	Belfast	Londonderry
	5ft 6in	4ft 9in	3ft 10in

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	0 5	Add.	9	2 43	Add.	17	5 31	Add.	25	8 20	Add.
2	0 24		10	3 4		18	5 53		26	8 40	
3	0 43		11	3 24		19	6 14		27	9 1	
4	1 3		12	3 45		20	6 35		28	9 21	
5	1 22		13	4 6		21	6 56		29	9 41	
6	1 42		14	4 28		22	7 18		30	10 0	
7	2 2		15	4 49		23	7 38				
8	2 23		16	5 10		24	7 59				

The times of high water are given for Mean time at place; if Dublin or Railway time be required,—for KINGSTOWN *subtract* 1 m. for Dublin time. | BELFAST *subtract* 2 m. | LONDONDERRY *add* 4 m.

SEPTEMBER, 1899.

WEEK DAY.	MONTH DAY.	MOON'S TRANSIT. H. M.	SLIGO BAY (*Mullaghmore*). APPROXIMATE {RISE 6 10 / FALL 6 20} MORNING Time H.M.	Height F.I.	AFTERNOON Time H.M.	Height F.I.	GALWAY (*Nimmo pier*). APPROXIMATE {RISE 6 30 / FALL 6 0} MORNING Time H.M.	Height F.I.	AFTERNOON Time H.M.	Height F.I.	QUEENSTOWN (*Scott's wharf*). APPROXIMATE {RISE 6 5 / FALL 6 25} MORNING Time H.M.	Height F.I.	AFTERNOON Time H.M.	Height F.I.
F.	1	9m16	2 54	8 6	3 18	8 10	2 4	11 1	2 29	11 6	2 15	9 2	2 45	9 6
S.	2	10 0	3 37	9 3	3 54	9 7	2 52	12 0	3 12	12 5	3 9	9 10	3 30	10 1
S.	3	10 43	4 11	9 11	4 27	10 2	3 30	12 9	3 47	13 2	3 50	10 5	4 9	10 8
M.	4	11 24	4 43	10 5	4 59	10 8	4 3	13 6	4 19	13 10	4 26	10 11	4 43	11 2
Tu.	5	0a 5	5 15	10 10	5 30	10 11	4 34	14 1	4 49	14 4	5 0	11 4	5 15	11 5
W.	6	0 47	5 44	11 0	5 58	11 1	5 4	14 6	5 19	14 7	5 30	11 6	5 45	11 7
Th.	7	1 29	6 13	11 0	6 28	10 11	5 34	14 7	5 49	14 6	6 0	11 7	6 15	11 6
F.	8	2 13	6 43	10 0	6 59	10 8	6 4	14 5	6 20	14 3	6 30	11 6	6 46	11 2
S.	9	3 0	7 15	10 5	7 31	10 2	6 36	14 0	6 53	13 8	7 2	11 3	7 18	11 0
S.	10	3 50	7 48	9 10	8 8	9 6	7 12	13 4	7 32	13 0	7 35	10 9	7 53	10 6
M.	11	4 43	8 30	9 2	8 55	8 11	7 54	12 6	8 17	12 0	8 12	10 3	8 32	10 0
Tu.	12	5 39	9 24	8 8	9 58	8 5	8 43	11 6	9 12	11 1	8 55	9 8	9 20	9 4
W.	13	6 37	10 37	8 3	11 20	8 2	9 46	10 9	10 28	10 7	9 50	9 2	10 27	9 0
Th.	14	7 36	—	—	0 5	8 3	11 15	10 8	—	—	11 12	9 0	11 59	9 2
F.	15	8 33	0 49	8 5	1 31	8 9	0 1	11 0	0 44	11 6	—	—	0 44	9 6
S.	16	9 29	2 9	8 2	2 40	9 8	1 21	12 1	1 51	12 9	1 26	9 10	2 4	10 3
S.	17	10 24	3 6	10 2	3 29	10 8	2 20	13 3	2 47	14 1	2 37	10 9	3 5	11 3
M.	18	11 18	3 50	11 2	4 12	11 7	3 12	14 9	3 34	15 3	3 30	11 8	3 54	12 1
Tu.	19	m.	4 34	11 11	4 56	12 2	3 55	15 9	4 16	16 1	4 17	12 5	4 40	12 8
W.	20	0 11	5 18	12 4	5 40	12 4	4 37	16 4	4 58	16 5	5 3	12 10	5 25	12 10
Th.	21	1 4	6 1	12 2	6 21	12 0	5 19	16 3	5 40	16 1	5 47	12 9	6 8	12 8
F.	22	1 58	6 41	11 8	7 1	11 4	6 1	15 9	6 22	15 3	6 28	12 5	6 48	12 1
S.	23	2 53	7 21	10 11	7 41	10 5	6 43	14 9	7 4	14 2	7 8	11 9	7 28	11 4
S.	24	3 47	8 2	9 11	8 24	9 5	7 26	13 6	7 48	12 10	7 48	10 11	8 7	10 6
M.	25	4 41	8 49	8 11	9 19	8 6	8 12	12 1	8 39	11 4	8 27	10 0	8 51	9 7
Tu.	26	5 34	9 53	8 2	10 31	7 11	9 8	10 9	9 42	10 3	9 17	9 2	9 46	8 10
W.	27	6 24	11 11	7 9	11 52	7 8	10 20	9 11	11 1	9 10	10 19	8 7	11 0	8 5
Th.	28	7 12	—	—	0 32	7 9	11 44	9 11	—	—	11 42	8 5	—	—
F.	29	7 57	1 11	7 10	1 48	8 1	0 24	10 1	1 0	10 6	0 22	8 7	1 1	8 9
S.	30	8 40	2 19	8 5	2 44	8 9	1 30	10 11	1 55	11 4	1 37	9 0	2 7	9 4

Half mean spring range.	5ft. 7in.	7ft. 5in.	5ft. 10in.

Phases of the moon.				Moon's declination at noon.							
	D.	H.	M.	M.D.	° ′	M.D.	° ′	M.D.	° ′	M.D.	° ′
New - - -	5	3	33 Morning.	1	17 N.43	9	17 S. 1	17	8 S.49	25	23 N.26
First Quarter -	12	9	49 Afternoon.	2	14 8	10	20 12	18	8 59	26	22 46
Full - - -	19	0	31 Afternoon.	3	10 0	11	22 26	19	3 N. 0	27	21 2
Last Quarter -	26	3	3 Afternoon.	4	5 30	12	23 29	20	8 45	28	18 23
				5	0 46	13	23 12	21	13 52	29	15 0
In Apogee - -	3	1	Morning.	6	4 S. 2	14	21 29	22	18 4	30	11 2
In Perigee - -	18	7	Morning.	7	8 43	15	18 23	23	21 7		
In Apogee - -	30	0	Noon.	8	13 7	16	14 4	24	22 55		

The times of high water are given for Mean time at place; if Dublin or Railway time be required,—for
SLIGO BAY *add* 9 m. | GALWAY *add* 11 m. | QUEENSTOWN *add* 8 m.

SEPTEMBER, 1899.

WATERFORD (*Duncannon fort*).
APPROXIMATE - { RISE 0 5 / FALL 0 20 } (H. M.)

WEEK DAY	MONTH DAY	MORNING Time H. M.	MORNING Height F. L.	AFTERNOON Time H. M.	AFTERNOON Height F. L.	MORNING Time	MORNING Height	AFTERNOON Time	AFTERNOON Height	MORNING Time	MORNING Height	AFTERNOON Time	AFTERNOON Height	☽'S AGE AT NOON.
F.	1	2 25	9 11	2 57	10 3									26·0
S.	2	3 24	10 7	3 48	10 11									27·0
S.	3	4 9	11 2	4 29	11 5									28·0
M.	4	4 48	11 8	5 5	11 10									29·0
Tu.	5	5 21	12 0	5 36	12 1									●
W.	6	5 51	12 2	6 6	12 3									1·3
Th.	7	6 21	12 4	6 36	12 3									2·3
F.	8	6 51	12 3	7 6	12 2									3·3
S.	9	7 22	12 1	7 38	11 11									4·3
S.	10	7 54	11 9	8 12	11 6									5·3
M.	11	8 30	11 3	8 49	11 0									6·3
Tu.	12	9 9	10 9	9 35	10 5									☽
W.	13	10 9	10 1	10 49	9 10									8·3
Th.	14	11 31	9 9	—	—									9·3
F.	15	0 13	9 11	0 55	10 2									10·3
S.	16	1 35	10 7	2 13	11 0									11·3
S.	17	2 49	11 6	3 21	12 0									12·3
M.	18	3 48	12 5	4 14	12 10									13·3
Tu.	19	4 39	13 2	5 3	13 4									○
W.	20	5 25	13 5	5 47	13 6									15·3
Th.	21	6 8	13 5	6 29	13 4									16·3
F.	22	6 49	13 2	7 9	12 11									17·3
S.	23	7 29	12 7	7 48	12 3									18·3
S.	24	8 7	11 11	8 25	11 6									19·3
M.	25	8 44	11 0	9 5	10 7									20·3
Tu.	26	9 31	10 2	10 4	9 9									☾
W.	27	10 41	9 5	11 19	9 3									22·3
Th.	28	11 57	9 2	—	—									23·3
F.	29	0 35	9 4	1 11	9 6									24·3
S.	30	1 45	9 9	2 17	10 1									25·3

Half mean spring range } 6ft. 2in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	0 5	Add.	9	2 43	Add.	17	5 31	Add.	25	8 20	Add.
2	0 24		10	3 4		18	5 53		26	8 40	
3	0 43		11	3 24		19	6 14		27	9 1	
4	1 3		12	3 45		20	6 35		28	9 21	
5	1 22		13	4 6		21	6 56		29	9 41	
6	1 42		14	4 28		22	7 18		30	10 0	
7	2 2		15	4 49		23	7 38				
8	2 23		16	5 10		24	7 59				

OCTOBER, 1899.

WEEK DAY	MONTH DAY	MOON'S TRANSIT H. M.	BREST (Entr. of Dockyard basin). APPROXIMATE RISE 0 10 / FALL 0 20				DEVONPORT (H.M. Dockyard). High Water. APPROXIMATE RISE 0 0 / FALL 0 10				Low Water			
			MORNING Time H.M.	Height F.I.	AFTERNOON Time H.M.	Height F.I.	MORNING Time H.M.	Height F.I.	AFTERNOON Time H.M.	Height F.I.	MORNING Time H.M.	Height F.I.	AFTERNOON Time H.M.	Height F.I.
S.	1	9m22	1 30	15 0	1 51	15 8	3 0	12 6	3 26	13 8	9 18	3 8	9 44	2 5
M.	2	10 4	2 8	16 4	2 23	16 11	3 49	13 4	4 10	14 4	10 5	2 8	10 25	1 6
Tu.	3	10 45	2 38	17 6	2 54	18 0	4 30	14 1	4 48	14 10	10 44	1 9	11 2	0 10
W.	4	11 27	3 10	18 5	3 26	18 8	5 5	14 9	5 22	15 3	11 20	0 11	11 37	0 4
Th.	5	0a12	3 42	18 9	3 58	18 10	5 38	15 1	5 54	15 4	11 53	0 5	—	—
F.	6	0 58	4 14	18 11	4 30	18 10	6 10	15 3	6 26	15 3	0 9	0 1	0 25	0 3
S.	7	1 48	4 46	18 8	5 2	18 6	6 42	15 2	6 57	15 0	0 41	0 3	0 57	0 6
S.	8	2 40	5 19	18 3	5 38	17 11	7 12	14 11	7 28	14 7	1 12	0 7	1 28	0 9
M.	9	3 35	5 58	17 6	6 18	17 0	7 46	14 7	8 4	14 0	1 45	1 2	2 2	1 3
Tu.	10	4 32	6 40	16 4	7 4	15 9	8 23	14 1	8 44	13 4	2 20	1 10	2 38	1 11
W.	11	5 29	7 30	15 1	7 59	14 6	9 7	13 8	9 35	12 9	2 57	2 10	3 18	2 9
Th.	12	6 25	8 33	14 1	9 12	13 11	10 5	13 0	10 41	12 1	3 42	3 10	4 13	3 6
F.	13	7 19	9 56	14 0	10 42	14 3	11 21	12 9	—	—	4 53	4 6	5 38	4 1
S.	14	8 12	11 27	14 10	—	—	0 7	12 1	0 53	13 3	6 23	4 8	7 7	3 5
S.	15	9 5	0 6	15 6	0 39	16 4	1 36	12 10	2 15	14 1	7 49	3 7	8 29	2 2
M.	16	9 56	1 7	17 2	1 32	17 11	2 48	14 0	3 17	15 1	9 4	2 3	9 34	1 1
Tu.	17	10 49	1 56	18 8	2 18	19 4	3 45	14 11	4 11	15 10	10 1	1 1	10 26	*0
W.	18	11 42	2 40	19 10	3 2	20 3	4 35	15 8	4 59	16 3	10 50	0 0	11 13	*0 7
Th.	19	m.	3 23	20 4	3 44	20 4	5 21	16 1	5 43	16 3	11 36	*0 7	11 58	*0 7
F.	20	0 37	4 5	20 2	4 26	19 11	6 5	16 2	6 25	16 1	—	—	0 19	*0 9
S.	21	1 33	4 47	19 6	5 7	19 1	6 44	15 10	7 3	15 7	0 39	*0 7	0 59	*0 3
S.	22	2 28	5 27	18 6	5 47	17 11	7 22	15 5	7 40	14 9	1 18	0 0	1 37	0 3
M.	23	3 23	6 8	17 2	6 29	16 4	7 58	14 9	8 15	13 10	1 55	1 0	2 13	1 2
Tu.	24	4 15	6 51	15 6	7 14	14 10	8 32	13 11	8 51	12 10	2 30	2 2	2 46	2 3
W.	25	5 5	7 39	14 2	8 6	13 6	9 12	13 1	9 36	11 10	3 3	3 6	3 22	3 4
Th.	26	5 52	8 36	13 2	9 12	12 11	10 3	12 3	10 34	11 2	3 45	4 9	4 15	4 4
F.	27	6 36	9 50	12 10	10 28	12 11	11 9	11 11	11 47	11 2	4 49	5 7	5 26	4 11
S.	28	7 18	11 5	13 2	11 40	13 6	—	—	0 26	12 1	6 4	5 7	6 41	4 8
S.	29	8 0	—	—	0 12	14 0	1 3	11 7	1 38	12 7	7 18	4 11	7 53	3 10
M.	30	8 41	0 40	14 6	1 4	15 1	2 10	12 4	2 38	13 4	8 26	3 11	8 55	2 10
Tu.	31	9 23	1 25	15 9	1 44	16 4	3 13	14 1	3 27	14 1	9 21	2 11	9 44	2 0
Half mean spring range			9ft. 6in.				7ft. 9in.							

Phases of the moon.

	D.	H.	M.	
New - - -	4	7	14	Afternoon.
First Quarter -	12	6	10	Morning.
Full - - - -	18	10	5	Afternoon.
Last Quarter -	26	9	40	Morning.
In Perigee -	16	10		Morning.
In Apogee -	28	5		Morning.

Moon's declination at noon.

M.D.	° '	M.D.	° '	M.D.	° '	M.D.	° '
1	6 N.40	9	23 8. 7	17	6 N.23	25	19 N. 5
2	2 0	10	23 9	18	11 42	26	15 54
3	2 8.46	11	21 48	19	16 17	27	12 7
4	7 29	12	19 9	20	19 50	28	7 52
5	11 58	13	15 19	21	22 10	29	3 20
6	16 0	14	10 32	22	23 10	30	1 8.23
7	19 22	15	5 6	23	22 54	31	6 6
8	21 48	16	0 N.39	24	21 29		

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for BREST add 18 m. | DEVONPORT add 17 m.
* Below zero, or datum to which soundings on charts are reduced.

OCTOBER, 1899.

WEEK DAY	MONTH DAY	PORTSMOUTH (H.M. Dockyard). High Water APPROXIMATE { RISE 7 20 / FALL 5 10				Low Water				DOVER (North pier). APPROXIMATE { RISE 5 0 / FALL 7 30				D'S AGE AT NOON
		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.		
		Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	D.
S.	1	9 22	11 5	9 44	11 9	2 12	2 8	2 34	2 2	8 44	15 7	9 6	16 1	26·3
M.	2	10 3	12 1	10 18	12 5	2 53	1 9	3 10	1 5	9 25	16 7	9 43	17 0	27·3
Tu.	3	10 34	12 8	10 50	12 11	3 25	1 1	3 40	0 10	10 0	17 5	10 17	17 9	28·3
W.	4	11 6	13 1	11 22	13 2	3 55	0 7	4 11	0 5	10 34	18 0	10 51	18 3	●
Th.	5	11 38	13 3	11 54	13 3	4 27	0 3	4 43	0 2	11 8	18 5	11 26	18 6	0·7
F.	6	—	—	0 11	13 5	4 58	0 1	5 13	0 1	11 44	18 6	—	—	1·7
S.	7	0 28	13 4	0 45	13 3	5 28	0 2	5 44	0 3	0 2	18 6	0 20	18 5	2·7
S.	8	1 2	13 1	1 20	12 11	6 1	0 5	6 19	0 7	0 38	18 4	0 57	18 2	3·7
M.	9	1 39	12 9	1 58	12 7	6 37	0 10	6 55	1 2	1 17	17 11	1 38	17 8	4·7
Tu.	10	2 18	12 5	2 39	12 1	7 14	1 7	7 36	2 0	1 59	17 3	2 21	16 10	5·7
W.	11	3 2	11 9	3 28	11 6	8 1	2 5	8 31	2 10	2 44	16 4	3 9	15 11	6·7
Th.	12	3 56	11 3	4 29	11 0	9 6	3 3	9 46	3 6	3 37	15 5	4 8	15 0	☽
F.	13	5 6	10 10	5 48	10 9	10 30	3 5	11 18	3 6	4 42	14 8	5 19	14 7	8·7
S.	14	6 32	10 10	7 15	11 1	—	—	0 5	3 4	6 0	14 10	6 41	15 4	9·7
S.	15	7 54	11 7	8 30	12 1	0 46	2 10	1 21	2 3	7 20	15 11	7 54	16 8	10·7
M.	16	9 0	12 6	9 26	12 11	1 49	1 8	2 13	1 1	8 22	17 4	8 49	17 11	11·7
Tu.	17	9 50	13 4	10 13	13 8	2 36	0 7	2 58	0 2	9 14	18 5	9 38	18 11	12·7
W.	18	10 35	13 10	10 57	14 0	3 20	*0 5	3 42	*0 5	10 2	19 3	10 26	19 6	○
Th.	19	11 19	14 1	11 41	14 2	4 3	*0 7	4 24	*0 8	10 50	19 8	11 13	19 8	14·7
F.	20	—	—	0 3	14 1	4 44	*0 8	5 4	*0 7	11 36	19 7	11 59	19 5	15·7
S.	21	0 25	13 11	0 47	13 8	5 25	*0 5	5 45	*0 2	—	—	0 22	19 1	16·7
S.	22	1 8	13 5	1 29	13 1	6 5	0 6	6 25	0 6	0 45	18 9	1 7	18 4	17·7
M.	23	1 49	12 10	2 9	12 6	6 45	1 0	7 5	1 6	1 28	17 11	1 49	17 5	18·7
Tu.	24	2 30	12 1	2 52	11 8	7 25	2 0	7 48	2 6	2 10	16 10	2 32	16 2	19·7
W.	25	3 14	11 4	3 37	11 0	8 14	3 0	8 43	3 5	2 55	15 8	3 18	15 2	20·7
Th.	26	4 3	10 8	4 32	10 6	9 15	3 10	9 51	4 1	3 43	14 8	4 11	14 2	☽
F.	27	5 6	10 4	5 42	10 2	10 31	4 2	11 1?	4 2	4 41	13 10	5 14	13 9	22·7
S	28	6 18	10 2	6 53	10 3	11 52	4 1	—	—	5 47	13 8	6 21	13 11	23·7
S.	29	7 27	10 6	8 0	10 10	0 28	3 10	1 0	3 6	6 54	14 4	7 26	14 9	24·7
M.	30	8 30	11 2	8 55	11 6	1 27	3 1	1 50	2 8	7 55	15 3	8 20	15 9	25·7
Tu.	31	9 17	11 10	9 38	12 1	2 11	2 3	2 30	1 10	8 40	16 2	9 0	16 7	26·7

Half mean spring range.   6ft. 9in.   9ft. 4in.

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	10	19	Add.	9	12	41	Add.	17	14	35	Add.	25	15	51	Add.
2	10	38		10	12	57		18	14	47		26	15	57	
3	10	57		11	13	12		19	14	58		27	16	3	
4	11	15		12	13	27		20	15	8		28	16	8	
5	11	33		13	13	42		21	15	18		29	16	12	
6	11	51		14	13	56		22	15	28		30	16	15	
7	12	8		15	14	10		23	15	36		31	16	18	
8	12	25		16	14	22		24	15	44					

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for PORTSMOUTH add 4 m. | DOVER subtract 5 m.
* Below zero, or datum to which soundings on charts are reduced.

OCTOBER, 1899.

Week Day	Month Day	Moon's Transit H. M.	SHEERNESS (H.M. Dockyard) APPROXIMATE {RISE 6 5 / FALL 6 25} Morning Time H.M.	Height F. I.	Afternoon Time H.M.	Height F. I.	CHATHAM (H.M. Dockyard) High Water Morning Time H.M.	Height F. I.	Afternoon Time H.M.	Height F. I.	APPROXIMATE {RISE 6 35 / FALL 6 5} Low Water Morning Time H.M.	Height F. I.	Afternoon Time H.M.	Height F. I.
S.	1	9m22	10 39	13 9	11 3	14 1	10 48	15 3	11 12	15 8	4 33	2 8	5 0	2 4
M.	2	10 4	11 23	14 5	11 40	14 9	11 31	16 1	11 47	16 5	5 25	2 0	5 47	1 8
Tu.	3	10 45	11 55	15 1	—				0 2	16 9	6 6	1 5	6 22	1 3
W.	4	11 27	0 11	15 4	0 27	15 7	0 17	17 2	0 33	17 6	6 38	1 1	6 54	0 11
Th.	5	0a12	0 43	15 9	0 59	15 11	0 49	17 9	1 5	17 11	7 10	0 9	7 26	0 7
F.	6	0 58	1 14	16 0	1 29	16 0	1 21	18 0	1 37	18 1	7 42	0 5	7 58	0 5
S.	7	1 48	1 45	16 0	2 1	15 11	1 52	18 0	2 7	17 11	8 14	0 5	8 29	0 6
S.	8	2 40	2 17	15 10	2 33	15 9	2 22	17 9	2 38	17 7	8 43	0 7	8 57	0 9
M.	9	3 35	2 50	15 7	3 8	15 4	2 55	17 4	3 14	17 2	9 12	1 0	9 28	1 3
Tu.	10	4 32	3 27	15 1	3 47	14 9	3 34	16 11	3 54	16 6	9 44	1 5	10 0	1 8
W.	11	5 29	4 9	14 5	4 34	14 1	4 15	16 2	4 38	15 8	10 18	2 0	10 40	2 4
Th.	12	6 25	5 2	13 9	5 33	13 6	5 4	15 3	5 35	14 11	11 6	2 9	11 36	3 3
F.	13	7 19	6 9	13 3	6 52	13 1	6 12	14 9	6 56	14 8	—		0 14	3 5
S.	14	8 12	7 38	13 3	8 24	13 6	7 41	14 8	8 27	14 10	1 1	3 2	1 51	2 10
S.	15	9 5	9 6	13 11	9 43	14 3	9 12	15 4	9 51	16 0	2 41	2 4	3 27	1 11
M.	16	9 56	10 14	14 11	10 41	15 4	10 24	16 7	10 50	17 2	4 5	1 5	4 36	0 11
Tu.	17	10 49	11 6	15 9	11 29	16 2	11 14	17 8	11 36	18 1	5 3	0 6	5 29	0 1
W.	18	11 42	11 51	16 6	—		11 58	18 6			5 54	*0 5	6 17	*0 5
Th.	19	m.	0 13	16 8	0 34	16 10	0 20	18 10	0 42	19 1	6 40	*0 6	7 2	*0 7
F.	20	0 37	0 55	17 0	1 16	16 11	1 3	19 2	1 23	19 1	7 24	*0 8	7 46	*0 8
S.	21	1 33	1 37	16 10	1 58	16 7	1 43	19 0	2 3	18 9	8 7	*0 6	8 27	*0 4
S.	22	2 28	2 18	16 4	2 38	16 1	2 23	18 4	2 43	17 11	8 45	0 0	9 3	0 4
M.	23	3 23	2 58	15 9	3 18	15 4	3 3	17 6	3 24	17 1	9 20	0 9	9 36	1 2
Tu.	24	4 15	3 38	14 11	3 59	14 5	3 45	16 8	4 6	16 2	9 52	1 7	10 9	2 0
W.	25	5 5	4 21	13 11	4 46	13 4	4 27	15 7	4 49	15 0	10 28	2 6	10 50	3 0
Th.	26	5 52	5 12	13 3	5 40	12 11	5 14	14 8	5 43	14 4	11 15	3 6	11 44	3 11
F.	27	6 36	6 13	12 7	6 52	12 6	6 17	14 1	6 57	13 11	—		0 20	4 0
S.	28	7 18	7 32	12 6	8 10	12 7	7 36	13 10	8 14	13 10	1 3	3 10	1 46	3 8
S.	29	8 0	8 46	12 10	9 19	13 2	8 51	14 1	9 26	14 5	2 27	3 5	3 6	3 1
M.	30	8 41	9 49	13 6	10 16	13 10	9 59	14 11	10 26	15 4	3 41	2 10	4 11	2 6
Tu.	31	9 23	10 39	14 2	10 59	14 6	10 48	15 9	11 8	16 1	4 37	2 2	5 0	1 10

Half mean spring range	8ft 0in	9ft 1in

Phases of the moon.	D.	H.	M.	
New	4	7	14	Afternoon.
First Quarter	12	6	10	Morning.
Full	18	10	5	Afternoon.
Last Quarter	26	9	40	Morning.
In Perigee		16	10	Morning.
In Apogee		28	5	Morning.

Moon's declination at noon.

M.D.	° ′	M.D.	° ′	M.D.	° ′	M.D.	° ′
1	6 N.40	9	23 S. 7	17	6 N.23	25	19 N. 5
2	2 0	10	23 9	18	11 42	26	15 54
3	2 S.46	11	21 48	19	16 17	27	12 7
4	7 29	12	19 9	20	19 50	28	7 52
5	11 58	13	15 19	21	22 10	29	3 20
6	16 0	14	10 32	22	23 10	30	1 S.23
7	19 22	15	5 6	23	22 54	31	6 6
8	21 48	16	0 N.39	24	21 29		

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for SHEERNESS *subtract* 3 m. | CHATHAM *subtract* 2 m.
* Below zero, or datum to which soundings on charts are reduced.

OCTOBER, 1899.

APPROXIMATE — LONDON (London Bridge): Rise 5 30, Fall 7 0.
APPROXIMATE — HARWICH (Angel quay): Rise 6 25, Fall 6 0.
APPROXIMATE — HULL (Victoria dock): Rise 5 40, Fall 6 39.

Week Day	Month Day	London Morning Time H.M.	Height F.I.	London Afternoon Time H.M.	Height F.I.	Harwich Morning Time	Height	Harwich Afternoon Time	Height	Hull Morning Time	Height	Hull Afternoon Time	Height	Moon's Age at Noon
S.	1	11 56	17 10	—		9 46	10 2	10 11	10 5	+ 8	17 4	+ 32	17 11	26·3
M.	2	0 21	18 4	0 42	18 9	10 33	10 8	10 52	10 10	+ 52	18 5	5 9	18 11	27·3
Tu.	3	1 0	19 2	1 15	19 5	11 8	11 0	11 24	11 3	5 25	19 4	5 41	19 8	28·3
W.	4	1 31	19 8	1 47	19 11	11 40	11 5	11 56	11 6	5 57	20 0	6 13	20 3	●
Th.	5	2 3	20 2	2 18	20 4	—		0 12	11 6	6 29	20 5	6 45	20 7	0·7
F.	6	2 33	20 6	2 48	20 7	0 27	11 7	0 43	11 6	7 1	20 8	7 17	20 9	1·7
S.	7	3 3	20 7	3 19	20 6	0 59	11 6	1 15	11 5	7 33	20 8	7 49	20 6	2·7
S.	8	3 35	20 5	3 52	20 3	1 31	11 4	1 48	11 3	8 6	20 4	8 24	20 2	3·7
M.	9	4 10	20 2	4 28	20 0	2 6	11 2	2 25	11 0	8 43	19 10	9 3	19 5	4·7
Tu.	10	4 47	19 9	5 7	19 4	2 45	10 10	3 5	10 8	9 23	18 11	9 45	18 5	5·7
W.	11	5 29	18 10	5 54	18 5	3 26	10 5	3 49	10 3	10 10	17 11	10 40	17 5	6·7
Th.	12	6 22	18 0	6 53	17 7	4 15	10 1	4 45	9 11	11 14	17 0	11 53	16 7	☽
F.	13	7 28	17 4	8 8	17 4	5 19	9 10	5 58	9 9	—		0 34	16 5	8·7
S.	14	8 51	17 6	9 37	17 9	6 44	9 10	7 30	10 0	1 16	16 6	1 57	16 10	9·7
S.	15	10 19	18 1	10 57	18 6	8 13	10 3	8 51	10 6	2 35	17 5	3 11	18 3	10·7
M.	16	11 29	19 2	11 57	19 9	9 23	10 10	9 50	11 2	3 42	19 0	4 19	19 9	11·7
Tu.	17	—		0 23	20 3	10 16	11 5	10 40	11 8	4 35	20 4	4 58	20 11	12·7
W.	18	0 47	20 8	1 9	21 0	11 3	11 10	11 25	12 0	5 19	21 4	5 41	21 8	○
Th.	19	1 31	21 3	1 53	21 5	11 47	12 1	—		6 3	21 10	6 25	21 11	14·7
F.	20	2 15	21 6	2 36	21 7	0 9	12 1	0 31	12 0	6 47	21 11	7 9	21 10	15·7
S.	21	2 56	21 6	3 16	21 3	0 52	11 11	1 13	11 10	7 31	21 7	7 51	21 4	16·7
S.	22	3 37	21 0	3 58	20 4	1 33	11 8	1 54	11 5	8 12	20 11	8 33	20 4	17·7
M.	23	4 19	20 4	4 39	19 11	2 15	11 2	2 36	10 11	8 54	19 9	9 15	19 1	18·7
Tu.	24	4 59	19 6	5 20	18 11	2 57	10 8	3 18	10 5	9 36	18 4	9 58	17 9	19·7
W.	25	5 43	18 3	6 7	17 9	3 39	10 2	4 1	9 11	10 23	17 2	10 51	16 8	20·7
Th.	26	6 32	17 4	6 58	16 11	4 25	9 9	4 52	9 7	11 24	16 2	mid.	15 10	☾
F.	27	7 29	16 9	8 5	16 8	5 23	9 6	5 58	9 6	—		0 36	15 7	22·7
S.	28	8 44	16 9	9 24	16 10	6 38	9 5	7 18	9 6	1 11	15 6	1 45	15 7	23·7
S.	29	10 1	17 0	10 34	17 3	7 54	9 8	8 26	9 10	2 18	15 11	2 49	16 5	24·7
M.	30	11 4	17 6	11 31	17 11	8 55	10 0	9 22	10 3	3 18	17 0	3 45	17 6	25·7
Tu.	31	11 55	18 5	—		9 47	10 5	10 9	10 8	4 8	18 0	4 28	18 6	26·7

Half mean spring range — London: 10ft. 4in.   Harwich: 5ft. 9in.   Hull: 10ft. 5in.

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	10	19	Add.	9	12	41	Add.	17	14	35	Add.	25	15	51	Add.
2	10	38		10	12	57		18	14	47		26	15	57	
3	10	57		11	13	12		19	14	58		27	16	3	
4	11	15		12	13	27		20	15	8		28	16	8	
5	11	33		13	13	42		21	15	18		29	16	12	
6	11	51		14	13	56		22	15	28		30	16	15	
7	12	8		15	14	10		23	15	36		31	16	18	
8	12	25		16	14	22		24	15	44					

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for
LONDON 0 m.   HARWICH subtract 5 m.   HULL add 1 m.

OCTOBER, 1899.

Week Day	Month Day	Moon's Transit	Sunderland (North dock). Morning Time	Height	Afternoon Time	Height	North Shields (Low lighthouse). Morning Time	Height	Afternoon Time	Height	Leith (East pier). Morning Time	Height	Afternoon Time	Height
			Rise 6 5 / Fall 6 25				Rise 5 40 / Fall 6 45				Rise 6 0 / Fall 6 15			
S.	1	9m22	0 58	11 6	1 23	11 11	1 10	11 9	1 33	12 1	0 4	13 0	0 27	13 5
M.	2	10 4	1 44	12 4	2 3	12 8	1 51	12 5	2 7	12 10	0 45	13 11	1 2	14 5
Tu.	3	10 45	2 20	13 0	2 36	13 4	2 23	13 3	2 38	13 7	1 18	14 10	1 34	15 2
W.	4	11 27	2 52	13 7	3 7	13 10	2 53	13 10	3 7	14 0	1 50	15 6	2 6	15 10
Th.	5	0u12	3 22	14 0	3 37	14 2	3 22	14 2	3 37	14 4	2 21	16 0	2 36	16 2
F.	6	0 58	3 52	14 3	4 8	14 4	3 53	14 5	4 9	14 6	2 50	16 3	3 5	16 2
S.	7	1 48	4 24	14 3	4 40	14 2	4 26	14 4	4 43	14 4	3 21	16 0	3 37	15 10
S.	8	2 40	4 56	14 0	5 14	13 9	5 0	14 0	5 18	13 10	3 54	15 8	4 12	15 6
M.	9	3 35	5 33	13 5	5 54	13 2	5 38	13 7	5 58	13 4	4 31	15 3	4 52	15 0
Tu.	10	4 32	6 16	12 10	6 40	12 5	6 19	13 1	6 42	12 9	5 14	14 8	5 37	14 3
W.	11	5 29	7 6	12 1	7 34	11 9	7 8	12 4	7 38	12 0	6 3	13 10	6 33	13 5
Th.	12	6 25	8 5	11 4	8 41	11 2	8 12	11 7	8 51	11 4	7 7	13 0	7 45	12 9
F.	13	7 19	9 23	11 1	10 7	11 2	9 35	11 3	10 19	11 5	8 27	12 8	9 12	12 9
S.	14	8 12	10 50	11 4	11 29	11 9	11 2	11 8	11 42	12 1	9 56	13 9	10 36	13 5
S.	15	9 5	—	—	0 4	12 3	—	—	0 17	12 7	11 11	13 11	11 41	14 5
M.	16	9 56	0 34	12 0	1 1	13 5	0 46	13 2	1 10	13 6	—	—	0 5	16 1
Tu.	17	10 49	1 27	13 11	1 52	14 3	1 33	13 11	1 55	14 2	0 28	15 7	0 51	16 1
W.	18	11 42	2 15	14 7	2 37	14 10	2 16	14 10	2 37	15 1	1 13	16 7	1 35	16 11
Th.	19	m.	2 58	15 0	3 19	15 2	2 58	15 4	3 19	15 5	1 57	17 2	2 18	17 4
F.	20	0 37	3 40	15 3	4 0	15 2	3 40	15 5	4 1	15 4	2 38	17 2	2 59	17 0
S.	21	1 33	4 20	15 0	4 41	14 8	4 22	15 1	4 43	14 9	3 18	16 10	3 39	16 6
S.	22	2 28	5 2	14 4	5 23	13 10	5 5	14 4	5 27	13 11	4 0	16 1	4 21	15 8
M.	23	3 23	5 45	13 4	6 7	12 11	5 49	13 7	6 11	13 2	4 42	15 3	5 4	14 9
Tu.	24	4 15	6 29	12 5	6 53	11 11	6 33	12 8	6 56	12 3	5 27	14 3	5 51	13 8
W.	25	5 5	7 18	11 4	7 44	11 1	7 22	11 9	7 50	11 4	6 17	13 2	6 45	12 9
Th.	26	5 52	8 12	10 10	8 44	10 7	8 20	11 0	8 55	10 8	7 15	12 4	7 49	12 1
F.	27	6 36	9 22	10 5	10 1	10 4	9 35	10 8	10 14	10 8	8 27	11 11	9 7	11 10
S.	28	7 18	10 37	10 5	11 11	10 8	10 50	10 8	11 24	11 0	9 44	12 0	10 17	12 2
S.	29	8 0	11 41	10 11	—	—	11 55	11 3	—	—	10 48	12 5	11 17	12 10
M.	30	8 41	0 9	11 3	0 35	11 8	0 23	11 6	0 47	11 10	11 42	13 2	—	—
Tu.	31	9 23	0 58	12 0	1 19	12 5	1 9	12 2	1 27	12 6	0 3	13 6	0 21	13 11
Half mean spring range.			7ft. 2in.				7ft. 4in.				8ft. 2in.			

Phases of the moon.

	D.	H.	M.	
New	4	7	14	Afternoon.
First Quarter	12	6	10	Morning.
Full	18	10	5	Afternoon.
Last Quarter	26	9	40	Morning.
In Perigee		16	10	Morning.
In Apogee		28	5	Morning.

Moon's declination at noon.

M.D.	o '	M.D.	o '	M.D.	o '	M.D.	o '
1	6 N.40	9	23 S. 7	17	6 N.23	25	19 N. 5
2	2 0	10	23 9	18	11 42	26	15 54
3	2 S.46	11	21 48	19	16 17	27	12 7
4	7 29	12	19 9	20	19 50	28	7 52
5	11 58	13	15 19	21	22 10	29	3 20
6	16 0	14	10 32	22	23 10	30	1 S.23
7	19 22	15	5 6	23	22 54	31	6 6
8	21 48	16	0 N.39	24	21 29		

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for SUNDERLAND add 5 m. | NORTH SHIELDS add 6 m. | LEITH add 13 m.

OCTOBER, 1899.

WEEK DAY	MONTH DAY	THURSO (near Scrabster pier). APPROXIMATE { RISE 6 30 / FALL 6 0 } Morning Time / Height	Afternoon Time / Height	GREENOCK (East dock). APPROXIMATE { RISE 6 30 / FALL 6 0 } Morning Time / Height	Afternoon Time / Height	LIVERPOOL (George pier). APPROXIMATE { RISE 5 35 / FALL 5 50 } Morning Time / Height	Afternoon Time / Height	(D's) AGE AT NOON.
S.	1	6 28 10 2	6 46 10 9	9 43 8 7	10 4 8 9	9 6 22 2	9 25 23 5	26·3
M.	2	7 0 11 3	7 13 11 8	10 23 8 11	10 40 9 0	9 42 23 8	9 57 24 9	27·3
Tu.	3	7 26 12 1	7 40 12 6	10 57 9 2	11 14 9 4	10 13 24 10	10 29 25 9	28·3
W.	4	7 54 12 10	8 9 13 0	11 31 9 5	11 48 9 6	10 45 26 0	11 1 26 6	0·7
Th.	5	8 24 13 2	8 39 13 2	—	0 5 9 7	11 17 26 5	11 33 26 11	0·7
F.	6	8 54 13 1	9 10 13 0	0 21 9 8	0 38 9 9	11 49 26 10	—	1·7
S.	7	9 27 12 10	9 44 12 8	0 55 9 9	1 12 9 8	0 5 26	0 22 26 7	2·7
S.	8	10 2 12 5	10 22 12 2	1 29 9 7	1 46 9 7	0 39 26 3	0 57 25 11	3·7
M.	9	10 43 11 10	11 5 11 5	2 4 9 6	2 23 9 5	1 15 25 2	1 33 25 1	4·7
Tu.	10	11 29 11 0	11 56 10 8	2 43 9 3	3 4 9 1	1 53 23 9	2 14 23 8	5·7
W.	11	—	0 25 10 4	3 27 8 11	3 52 8 10	2 37 22 6	3 3 22 10	6·7
Th.	12	0 58 10 0	1 36 9 9	4 21 8 8	4 54 8 6	3 33 21 0	4 9 21 9	☽
F.	13	2 19 9 8	3 7 9 8	5 32 8 5	6 14 8 4	4 51 20 3	5 38 21 5	8·7
S.	14	3 54 9 10	4 36 10 1	6 58 8 6	7 40 8 6	6 26 21 2	7 9 22 8	9·7
S.	15	5 13 10 6	5 42 11 2	8 19 8 9	8 52 9 0	7 47 22 7	8 18 24 6	10·7
M.	16	6 5 11 9	6 27 12 5	9 20 9 3	9 46 9 6	8 44 24 4	9 8 26 8	11·7
Tu.	17	6 47 12 11	7 6 13 6	10 11 9 8	10 35 9 10	9 31 26 2	9 52 28 0	12·7
W.	18	7 26 13 10	7 46 14 4	10 59 9 11	11 22 10 0	10 13 27 4	10 35 28 9	O
Th.	19	8 6 14 4	8 26 14 3	11 45 10 1	—	10 57 27 11	11 19 28 11	14·7
F.	20	8 46 14 1	9 7 13 10	0 8 10 1	0 30 10 1	11 41 28 4	—	15·7
S.	21	9 28 13 6	9 50 13 1	0 52 10 0	1 13 9 11	0 3 28 6	0 24 27 7	16·7
S.	22	10 12 12 7	10 34 12 1	1 34 9 10	1 55 9 8	0 45 27 2	1 5 26 0	17·7
M.	23	10 56 11 7	11 19 11 0	2 15 9 6	2 34 9 3	1 25 25 3	1 45 24 5	18·7
Tu.	24	11 43 10 6	—	2 54 9 0	3 15 8 10	2 5 23 5	2 26 23 1	19·7
W.	25	0 9 10 0	0 36 9 8	3 38 8 8	4 2 8 6	2 49 21 9	3 14 21 8	20·7
Th.	26	1 6 9 4	1 41 9 0	4 28 8 4	4 57 8 2	3 41 20 6	4 14 20 5	☾
F.	27	2 20 8 10	3 0 8 9	5 31 8 0	6 8 7 11	4 52 19 6	5 32 19 10	22·7
S.	28	3 40 8 10	4 16 8 11	6 44 7 11	7 19 8 0	6 12 19 9	6 50 20 7	23·7
S.	29	4 49 9 2	5 18 9 5	7 53 8 1	8 24 8 3	7 24 20 6	7 54 21 6	24·7
M.	30	5 43 9 10	6 4 10 3	8 52 8 5	9 17 8 7	8 19 21 8	8 41 23 0	25·7
Tu.	31	6 22 10 9	6 39 11 2	9 39 8 9	9 58 8 11	9 1 23 1	9 19 24 2	26·7

Half mean spring range.		Thurso 6ft. 7in.		Greenock 4ft. 10in.		Liverpool 13ft. 9in.	

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	10	19	Add.	9	12	41	Add.	17	14	35	Add.	25	15	51	Add.
2	10	38		10	12	57		18	14	47		26	15	57	
3	10	57		11	13	12		19	14	58		27	16	3	
4	11	15		12	13	27		20	15	8		28	16	8	
5	11	33		13	13	42		21	15	18		29	16	12	
6	11	51		14	13	56		22	15	28		30	16	15	
7	12	8		15	14	10		23	15	36		31	16	18	
8	12	25		16	14	22		24	15	44					

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for THURSO *add* 14 m. | GREENOCK *add* 19 m. | LIVERPOOL *add* 12 m.

G

OCTOBER, 1899.

Week Day	Month Day	Moon's Transit	Pembroke (H.M. Dockyard) Rise 6 10 / Fall 6 20 — Morning Time	Ht. F.	Ht. I.	Afternoon Time	Ht. F.	Ht. I.	Portishead (Dock entr.) Rise 5 40 / Fall 6 40 — Morning Time	Ht. F.	Ht. I.	Afternoon Time	Ht. F.	Ht. I.	Holyhead (Pier) Rise 6 20 / Fall 6 0 — Morning Time	Ht. F.	Ht. I.	Afternoon Time	Ht. F.	Ht. I.
S.	1	9 22	3 38	18	4	4 2	19	0	4 43	34	9	5 6	36	0	8 2	13	6	8 21	13	11
M.	2	10 4	4 23	19	8	4 42	20	3	5 26	37	1	5 44	38	0	8 38	14	4	8 53	14	8
Tu.	3	10 45	5 0	20	9	5 18	21	3	6 2	39	0	6 20	39	10	9 8	15	0	9 23	15	3
W.	4	11 27	5 36	21	7	5 53	21	11	6 37	40	7	6 53	41	1	9 38	15	6	9 53	15	5
Th.	5	0a12	6 9	22	1	6 25	22	3	7 9	41	6	7 24	41	8	10 8	15	9	10 23	15	10
F.	6	0 58	6 41	22	4	6 56	22	3	7 40	41	8	7 56	41	6	10 38	15	11	10 53	15	10
S.	7	1 48	7 11	22	1	7 27	21	11	8 12	41	2	8 28	40	10	11 9	15	9	11 25	15	7
S.	8	2 40	7 45	21	8	8 4	21	3	8 45	40	5	9 3	39	10	11 43	15	5	—		
M.	9	3 35	8 24	20	11	8 44	20	5	9 21	39	3	9 39	38	5	0 4	15	2	0 26	14	10
Tu.	10	4 32	9 5	19	10	9 27	19	3	9 58	37	5	10 18	36	6	0 48	14	6	1 12	14	1
W.	11	5 29	9 50	18	9	10 15	18	2	10 41	35	5	11 6	34	1	1 38	13	9	2 6	13	4
Th.	12	6 25	10 44	17	8	11 18	17	3	11 36	33	2	—			2 38	13	0	3 16	12	9
F	13	7 19	11 57	17	3	—			0 12	32	5	0 54	32	4	4 0	12	8	4 46	12	9
S.	14	8 12	0 40	17	6	1 25	18	0	1 40	32	11	2 26	34	0	5 30	13	0	6 9	13	5
S.	15	9 5	2 8	18	9	2 46	19	8	3 10	35	6	3 49	37	3	6 44	13	11	7 14	14	5
M.	16	9 56	3 17	20	8	3 45	21	5	4 21	38	11	4 50	40	4	7 40	14	11	8 4	15	5
Tu.	17	10 49	4 12	22	2	4 38	22	10	5 16	41	7	5 40	42	8	8 26	15	10	8 47	16	3
W.	18	11 42	5 3	23	3	5 27	23	7	6 4	43	5	6 28	44	1	9 8	16	6	9 29	16	9
Th.	19	m.	5 50	23	9	6 12	23	10	6 50	44	6	7 11	44	6	9 50	16	10	10 10	16	10
F.	20	0 37	6 33	23	8	6 54	23	5	7 32	44	3	7 53	43	8	10 29	16	9	10 49	16	6
S.	21	1 33	7 14	23	0	7 34	22	6	8 14	42	10	8 34	41	11	11 10	16	3	11 31	15	11
S.	22	2 28	7 54	21	11	8 14	21	3	8 53	40	11	9 12	39	11	11 53	15	6	—		
M.	23	3 23	8 34	20	7	8 54	19	9	9 30	38	9	9 48	37	4	0 15	15	1	0 38	14	7
Tu.	24	4 17	9 15	19	0	9 36	18	4	10 7	36	0	10 27	34	10	1 1	14	1	1 25	13	7
W.	25	5 5	9 58	17	2	10 21	17	0	10 48	33	4	11 10	32	2	1 50	13	2	2 16	12	9
Th.	26	5 52	10 46	16	6	11 16	16	2	11 37	31	3	—			2 46	12	5	3 21	12	2
F.	27	6 36	11 50	16	0	—			0 11	30	5	0 49	30	2	4 1	12	0	4 40	12	0
S.	28	7 18	0 26	16	1	1 4	16	3	1 27	30	3	2 5	30	5	5 11	12	4	5 51	12	4
S.	29	8 0	1 42	16	8	2 16	17	3	2 41	31	6	3 16	32	8	6 22	12	7	6 51	12	11
M.	30	8 41	2 46	17	10	3 12	18	6	3 49	33	9	4 17	34	11	7 15	13	3	7 37	13	7
Tu.	31	9 23	3 36	19	1	3 58	19	8	4 39	36	1	5 1	37	1	7 57	14	0	8 15	14	3

Half mean spring range.	11ft. 3in.	21ft. 0in.	8ft. 0in.

Phases of the moon.

	D.	H.	M.	
New	4	7	14	Afternoon.
First Quarter	12	6	10	Morning.
Full	18	10	5	Afternoon.
Last Quarter	26	9	40	Morning.
In Perigee	16	10		Morning.
In Apogee	28	5		Morning.

Moon's declination at noon.

M.D.	°	'	M.D.	°	'	M.D.	°	'	M.D.	°	'
1	6 N.40		9	23 S. 7		17	6 N.23		25	19 N. 5	
2	2 0		10	23 9		18	11 42		26	15 54	
3	2 S.46		11	21 48		19	16 17		27	12 7	
4	7 29		12	19 19		20	19 50		28	7 52	
5	11 58		13	15 19		21	22 19		29	3 20	
6	16 0		14	10 32		22	23 10		30	1 S.23	
7	19 22		15	5 6		23	22 54		31	6 6	
8	21 48		16	0 N.39		24	21 29				

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for PEMBROKE add 20 m. | PORTISHEAD add 11 m. | HOLYHEAD add 18 m.

OCTOBER, 1899.

Approximate — KINGSTOWN (Watering pier): { RISE 6 15 / FALL 6 0 }
Approximate — BELFAST (New dock): { RISE 6 20 / FALL 6 0 }
Approximate — LONDONDERRY (Ship bridge): { RISE 6 15 / FALL 6 15 }

Week Day	Month Day	KINGSTOWN Morning Time	Morning Height	Afternoon Time	Afternoon Height	BELFAST Morning Time	Morning Height	Afternoon Time	Afternoon Height	LONDONDERRY Morning Time	Morning Height	Afternoon Time	Afternoon Height	☽'s Age at Noon
S.	1	8 55	9 6	9 17	9 9	8 36	8 4	8 55	8 7	5 46	6 5	6 5	6 7	26·3
M.	2	9 36	9 11	9 52	10 1	9 12	8 9	9 28	8 11	6 23	6 10	6 40	7 0	27·3
Tu.	3	10 7	10 3	10 21	10 6	9 44	9 1	10 0	9 3	6 57	7 2	7 13	7 4	28·3
W.	4	10 36	10 8	10 51	10 9	10 15	9 4	10 30	9 4	7 28	7 5	7 43	7 6	●
Th.	5	11 6	10 10	11 21	10 11	10 45	9 5	11 0	9 5	7 58	7 7	8 13	7 8	0·7
F.	6	11 37	10 10	11 54	10 10	11 15	9 5	11 30	9 4	8 28	7 8	8 43	7 7	1·7
S.	7	—	—	0 11	10 9	11 46	9 4	—	—	8 58	7 6	9 13	7 4	2·7
S.	8	0 28	10 6	0 46	10 6	0 4	9 3	0 23	9 3	9 29	7 2	9 47	7 0	3·7
M.	9	1 6	10 4	1 27	10 2	0 43	9 2	1 4	9 1	10 6	6 10	10 26	6 8	4·7
Tu.	10	1 48	10 0	2 11	9 9	1 27	8 11	1 52	8 9	10 51	6 5	11 22	6 1	5·7
W.	11	2 37	9 6	3 5	9 4	2 19	8 7	2 48	8 5	11 57	5 10	—	—	6·7
Th.	12	3 37	9 2	4 14	9 0	3 20	8 4	3 56	8 3	0 38	5 8	1 23	5 7	☽
F.	13	4 55	8 11	5 37	8 11	4 36	8 2	5 18	8 1	2 10	5 8	2 55	5 10	8·7
S.	14	6 18	9 1	6 56	9 4	6 0	8 2	6 40	8 3	3 36	6 0	4 11	6 5	9·7
S.	15	7 31	9 8	8 3	10 0	7 18	8 5	7 49	8 8	4 40	6 9	5 4	7 0	10·7
M.	16	8 33	10 4	9 0	10 9	8 14	8 11	8 38	9 2	5 26	7 3	5 48	7 6	11·7
Tu.	17	9 24	10 10	9 46	11 1	9 1	9 5	9 23	9 7	6 10	7 9	6 32	7 11	12·7
W.	18	10 6	11 3	10 27	11 5	9 45	9 8	10 6	9 9	6 54	8 1	7 16	8 2	○
Th.	19	10 48	11 6	11 9	11 6	10 27	9 10	10 47	9 10	7 37	8 3	7 58	8 3	14·7
F.	20	11 30	11 5	11 51	11 3	11 7	9 9	11 27	9 8	8 19	8 2	8 39	8 0	15·7
S.	21	—	—	0 12	11 1	11 48	9 7	—	—	8 58	7 9	9 18	7 6	16·7
S.	22	0 33	10 10	0 54	10 7	0 10	9 5	0 32	9 3	9 38	7 3	9 58	7 0	17·7
M.	23	1 16	10 4	1 38	10 0	0 54	9 2	1 17	9 0	10 18	6 9	10 40	6 5	18·7
Tu.	24	2 1	9 8	2 25	9 5	1 41	8 9	2 6	8 6	11 7	6 1	11 38	5 9	19·7
W.	25	2 49	9 2	3 15	9 0	2 32	8 4	2 59	8 2	—	—	0 12	5 6	20·7
Th.	26	3 45	8 9	4 18	8 7	3 28	8 1	4 0	8 0	0 49	5 4	1 30	5 3	☾
F.	27	4 54	8 6	5 30	8 5	4 35	7 11	5 12	7 10	2 13	5 3	2 51	5 4	22·7
S.	28	6 5	8 6	6 38	8 8	5 47	7 10	6 21	7 10	3 24	5 6	3 54	5 9	23·7
S.	29	7 9	8 11	7 38	9 1	6 53	7 11	7 23	8 0	4 21	5 11	4 45	6 1	24·7
M.	30	8 5	9 4	8 29	9 6	7 50	8 2	8 12	8 4	5 6	6 4	5 24	6 6	25·7
Tu.	31	8 51	9 8	9 12	9 11	8 31	8 7	8 49	8 9	5 41	6 8	5 59	6 9	26·7

Half mean spring range: Kingstown 5ft. 6in. — Belfast 4ft. 9in. — Londonderry 3ft. 10in.

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	10	19	Add.	9	12	41	Add.	17	14	35	Add.	25	15	51	Add.
2	10	38		10	12	57		18	14	47		26	15	57	
3	10	57		11	13	12		19	14	58		27	16	3	
4	11	15		12	13	27		20	15	8		28	16	8	
5	11	33		13	13	42		21	15	18		29	16	12	
6	11	51		14	13	56		22	15	28		30	16	15	
7	12	8		15	14	10		23	15	36		31	16	18	
8	12	25		16	14	22		24	15	44					

The times of high water are given for Mean time at place; if Dublin or Railway time be required,—for KINGSTOWN subtract 1 m. for Dublin time. | BELFAST subtract 2 m. | LONDONDERRY add 4 m.

OCTOBER, 1899.

WEEK DAY	MONTH DAY	MOON'S TRANSIT	SLIGO BAY (Mullaghmore). APPROXIMATE { RISE 6 10 / FALL 6 20				GALWAY (Nimmo pier). APPROXIMATE { RISE 6 30 / FALL 6 0				QUEENSTOWN (Scott's wharf). APPROXIMATE { RISE 6 5 / FALL 6 25			
			MORNING.		AFTERNOON.		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.	
		H. M.	Time H.M.	Height F.I.	Time H.M.	Height F.I.	Time H.M.	Height F.I.	Time H.M.	Height F.I.	Time H.M.	Height F.I.	Time H.M.	Height F.I.
S.	1	9m22	3 6	9 1	3 25	9 5	2 19	11 10	2 39	12 3	2 33	9 8	2 56	10 0
M.	2	10 4	3 41	9 9	3 55	10 0	2 57	12 8	3 15	13 1	3 16	10 4	3 34	10 7
Tu.	3	10 45	4 10	10 4	4 25	10 1	3 31	13 5	3 46	13 9	3 51	10 10	4 8	11 4
W.	4	11 27	4 41	10 10	4 58	11 0	4 1	14 1	4 16	14 4	4 25	11 4	4 42	11 6
Th.	5	0a12	5 14	11 1	5 30	11 2	4 31	14 6	4 47	14 8	4 58	11 7	5 14	11 8
F.	6	0 58	5 45	11 2	6 0	11 1	5 3	14 9	5 20	14 8	5 31	11 8	5 46	11 7
S.	7	1 48	6 16	10 11	6 33	10 9	5 37	14 6	5 55	14 4	6 3	11 7	6 21	11 6
S.	8	2 40	6 51	10 7	7 10	10 3	6 13	14 2	6 32	13 10	6 39	11 4	6 57	11 2
M.	9	3 35	7 30	10 0	7 50	9 8	6 52	13 6	7 13	13 2	7 16	10 11	7 36	10 8
Tu.	10	4 32	8 13	9 4	8 39	9 0	7 36	12 9	8 2	12 3	7 56	10 5	8 18	10 1
W.	11	5 29	9 10	8 9	9 45	8 6	8 30	11 9	9 1	11 4	8 42	9 10	9 9	9 7
Th.	12	6 25	10 25	8 5	11 8	8 5	9 36	11 0	10 17	10 11	9 40	9 4	10 17	9 3
F.	13	7 19	11 51	8 6	—	—	11 1	11 0	11 45	11 4	10 59	9 3	11 43	9 4
S.	14	8 12	0 34	8 8	1 14	8 11	—	—	0 26	11 9	—	—	0 26	9 8
S.	15	9 5	1 50	9 4	2 20	9 9	1 2	12 3	1 32	12 11	1 6	10 0	1 41	10 5
M.	16	9 56	2 44	10 2	3 7	10 7	1 58	13 7	2 22	14 1	2 11	10 0	2 39	11 2
Tu.	17	10 49	3 28	11 0	3 49	11 4	2 45	14 6	3 7	14 11	3 5	11 6	3 29	11 10
W.	18	11 42	4 10	11 7	4 31	11 9	3 29	15 3	3 51	15 7	3 52	12 1	4 15	12 3
Th.	19	m.	4 52	11 11	5 13	11 11	4 13	15 9	4 35	15 10	4 38	12 5	5 0	12 6
F.	20	0 37	5 34	11 10	5 56	11 8	4 56	15 9	5 17	15 6	5 22	12 5	5 44	12 3
S.	21	1 33	6 18	11 5	6 40	11 1	5 38	15 2	6 0	14 9	6 5	12 0	6 26	11 9
S.	22	2 28	7 1	10 8	7 21	10 3	6 22	14 4	6 44	13 10	6 47	11 6	7 7	11 2
M.	23	3 23	7 41	9 9	8 2	9 4	7 6	13 3	7 28	12 8	7 27	10 10	7 47	10 5
Tu.	24	4 15	8 25	8 11	8 52	8 7	7 50	12 1	8 14	11 6	8 7	10 0	8 27	9 8
W.	25	5 5	9 22	8 4	9 55	8 1	8 39	11 0	9 6	10 6	8 49	9 4	9 13	9 1
Th.	26	5 52	10 31	7 11	11 9	7 10	9 38	10 1	10 15	10 1	9 42	8 10	10 16	8 9
F.	27	6 36	11 46	7 10	—	—	10 55	10 2	11 33	10 2	10 53	8 8	11 30	8 7
S.	28	7 18	0 21	7 11	0 55	8 1	—	—	0 8	10 5	—	—	0 6	8 9
S.	29	8 0	1 27	8 3	1 57	8 6	0 39	10 9	1 7	11 1	0 41	8 11	1 13	9 2
M.	30	8 41	2 22	8 10	2 43	9 2	1 33	11 6	1 55	11 11	1 42	9 5	2 8	9 9
Tu.	31	9 23	3 1	9 5	3 19	9 8	2 15	12 4	2 34	12 8	2 30	10 0	2 50	10 3
Half mean spring range.			5ft. 7in.				7ft. 5in.				5ft. 10in.			

Phases of the moon.

	D.	H.	M.	
New	4	7	14	Afternoon.
First Quarter	12	6	10	Morning.
Full	18	10	5	Afternoon.
Last Quarter	26	9	40	Morning.
In Perigee	16	10		Morning.
In Apogee	28	5		Morning.

Moon's declination at noon.

M.D.	o	'	M.D.	o	'	M.D.	o	'	M.D.	o	'
1	6 N.40		9	23 S. 7		17	6 N.23		25	19 N. 5	
2	2 0		10	23	9	18	11	42	26	15	54
3	2 S.46		11	21	48	19	16	17	27	12	7
4	7	29	12	19	9	20	19	50	28	7	52
5	11	48	13	15	19	21	22	19	29	3	20
6	16	0	14	10	32	22	23	10	30	1 S.23	
7	19	22	15	5	6	23	22	54	31	6	6
8	21	48	16	0 N.39		24	21	29			

The times of high water are given for Mean time at place ; if Dublin or Railway time be required,—for SLIGO BAY *add* 9 m. | GALWAY *add* 11 m. | QUEENSTOWN *add* 8 m.

OCTOBER, 1899.

WEEK DAY.	MONTH DAY.	WATERFORD (Duncannon fort). APPROXIMATE {RISE 6 5, FALL 6 20}																	D'S AGE NOON AT.
		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.		MORNING.		AFTERNOON.							
		Time. H. M.	Height. F. I.	Time. H. M.	Height. F. I.	Time.	Height.	Time.	Height.	Time.	Height.	Time.	Height.						D.
S.	1	2 46	10 5	3 11	10 9														26·3
M.	2	3 33	11 1	3 53	11 4														27·3
Tu.	3	4 12	11 7	4 30	11 10														28·3
W.	4	4 47	12 0	5 4	12 1														●
Th.	5	5 20	12 2	5 35	12 3														0·7
F.	6	5 51	12 4	6 7	12 4														1·7
S.	7	6 24	12 3	6 42	12 2														2·7
S.	8	7 0	12 1	7 18	12 0														3·7
M.	9	7 36	11 10	7 55	11 8														4·7
Tu.	10	8 14	11 5	8 35	11 1														5·7
W.	11	8 58	10 10	9 25	10 7														6·7
Th.	12	9 58	10 4	10 38	10 1														D
F.	13	11 19	10 0	11 59	10 1														8·7
S.	14	—	—	0 37	10 4														9·7
S.	15	1 15	10 8	1 50	11 2														10·7
M.	16	2 23	11 7	2 54	12 0														11·7
Tu.	17	3 22	12 4	3 48	12 8														12·7
W.	18	4 13	12 10	4 38	13 0														○
Th.	19	5 1	13 0	5 23	13 1														14·7
F.	20	5 45	13 0	6 6	12 11														15·7
S.	21	6 27	12 9	6 48	12 6														16·7
S.	22	7 8	12 3	7 27	12 0														17·7
M.	23	7 46	11 8	8 5	11 4														18·7
Tu.	24	8 24	11 0	8 44	10 8														19·7
W.	25	9 5	10 4	9 30	10 0														20·7
Th.	26	10 1	9 9	10 37	9 6														☾
F.	27	11 13	9 5	11 47	9 4														22·7
S.	28	—	—	0 19	9 6														23·7
S.	29	0 51	9 8	1 22	9 11														24·7
M.	30	1 51	10 2	2 19	10 6														25·7
Tu.	31	2 44	10 10	3 7	11 1														26·7

Half mean spring range. 6ft. 2in.

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	10	19	Add.	9	12	41	Add.	17	14	35	Add.	25	15	51	Add.
2	10	38		10	12	57		18	14	47		26	15	57	
3	10	57		11	13	12		19	14	58		27	16	3	
4	11	15		12	13	27		20	15	8		28	16	8	
5	11	33		13	13	42		21	15	18		29	16	12	
6	11	51		14	13	56		22	15	28		30	16	15	
7	12	8		15	14	10		23	15	36		31	16	18	
8	12	25		16	14	22		24	15	44					

The times of high water are given for Mean time at place ; if Dublin or Railway time be required,—for WATERFORD add 3 m.

NOVEMBER, 1899.

Week Day	Month Day	Moon's Transit H.M.	BREST (Entr. of Dockyard basin). APPROXIMATE {RISE 6 10 / FALL 6 20} Morning Time H.M.	Morning Height F.I.	Afternoon Time H.M.	Afternoon Height F.I.	DEVONPORT (H.M. Dockyard). High Water APPROXIMATE {RISE 6 0 / FALL 6 10} Morning Time H.M.	Morning Height F.I.	Afternoon Time H.M.	Afternoon Height F.I.	Low Water Morning Time H.M.	Morning Height F.I.	Afternoon Time H.M.	Afternoon Height F.I.
W.	1	10m 7	2 2	16 10	2 19	17 4	3 49	14 0	4 10	14 6	10 5	2 0	10 25	1 4
Th.	2	10 53	2 36	17 9	2 5	18 2	4 30	14 6	4 49	14 10	10 44	1 3	11 3	0 10
F.	3	11 42	3 12	18 5	3 30	18 7	5 7	15 0	5 25	15 1	11 22	0 7	11 41	0 6
S.	4	0a 34	3 48	18 9	4 7	18 9	5 43	15 3	6 1	15 3	—	—	noon	0 3
S.	5	1 30	4 26	18 8	4 45	18 7	6 19	15 4	6 37	15 0	0 18	0 3	0 36	0 2
M.	6	2 27	5 4	18 5	5 24	18 3	6 56	15 3	7 15	14 9	0 54	0 7	1 12	0 4
Tu.	7	3 24	5 45	17 11	6 7	17 6	7 35	15 0	7 55	14 3	1 31	1 0	1 50	0 9
W.	8	4 21	6 31	17 0	6 57	16 5	8 16	14 8	8 39	13 9	2 10	1 7	2 31	1 4
Th.	9	5 15	7 25	15 10	7 55	15 4	9 5	14 3	9 33	13 1	2 53	2 6	3 16	2 2
F.	10	6 8	8 27	14 11	9 1	14 9	10 3	13 9	10 36	12 7	3 42	3 5	4 12	3 0
S.	11	6 59	9 39	14 9	10 18	14 11	11 12	13 3	11 52	12 6	4 48	4 1	5 28	3 6
S.	12	7 49	10 57	15 2	11 34	15 7	—	—	0 33	13 6	6 8	4 3	6 48	3 3
M.	13	8 39	—	—	0 7	16 0	0 12	13 1	1 48	14 1	7 26	3 6	8 3	2 4
Tu.	14	9 30	0 37	16 6	1 5	17 1	2 21	13 11	2 52	14 9	8 38	2 4	9 9	1 5
W.	15	10 23	1 31	17 8	1 55	18 2	3 19	14 8	3 45	15 1	9 36	1 6	10 1	0 10
Th.	16	11 18	2 19	18 6	2 42	18 11	4 10	15 2	4 35	15 4	10 26	0 9	10 50	0 4
F.	17	m.	3 5	19 1	3 28	19 2	4 58	15 6	5 20	15 6	11 13	0 2	11 36	0 0
S.	18	0 14	3 50	19 1	4 10	18 11	5 42	15 7	6 4	15 4	11 58 *0	2	—	—
S.	19	1 9	4 30	18 8	4 50	18 5	6 24	15 6	6 43	15 0	0 19	0 1	0 39 *0	1
M.	20	2 4	5 10	18 1	5 29	17 8	7 2	15 3	7 20	14 5	0 58	0 8	1 17	0 5
Tu.	21	2 55	5 49	17 3	6 9	16 9	7 38	14 10	7 56	13 9	1 36	1 4	1 54	1 1
W.	22	3 44	6 29	16 2	6 50	15 7	8 13	14 2	8 31	13 0	2 11	2 2	2 28	1 10
Th.	23	4 30	7 12	15 1	7 34	14 7	8 50	13 5	9 10	12 3	2 45	3 2	3 3	2 10
F.	24	5 13	7 57	14 1	8 22	13 9	9 31	12 9	9 54	11 8	3 21	4 3	3 41	3 10
S.	25	5 55	8 50	13 6	9 21	13 5	10 19	12 2	10 47	11 4	4 5	5 0	4 33	4 6
S.	26	6 36	9 55	13 5	10 29	13 6	11 18	12 0	11 52	11 6	5 3	5 4	5 36	4 10
M.	27	7 17	11 3	13 8	11 35	13 11	—	—	0 28	12 3	6 10	5 2	6 44	4 6
Tu.	28	7 59	—	—	0 5	14 3	1 2	12 2	1 36	12 9	7 17	4 5	7 50	3 9
W.	29	8 44	0 34	14 8	1 0	15 2	2 7	12 10	2 36	13 3	8 23	3 6	8 53	3 0
Th.	30	9 32	1 24	15 8	1 45	16 3	3 3	13 5	3 28	13 9	9 20	2 9	9 45	2 4

Half mean spring range.	BREST 9ft. 6in.	DEVONPORT 7ft. 9in.

Phases of the moon.

	D.	H.	M.	
New	3	10	27	Morning.
First Quarter	10	1	35	Afternoon.
Full	17	10	18	Morning.
Last Quarter	25	6	35	Morning.
In Perigee	12	0		Noon.
In Apogee	25	2		Morning.

Moon's declination at noon.

M.D.	° '	M.D.	° '	M.D.	° '	M.D.	° '
1	10 S. 39	9	16 S. 6	17	21 N. 20	25	4 N. 46
2	14 51	10	11 36	18	22 51	26	0 8
3	18 26	11	6 27	19	23 3	27	4 S. 33
4	21 10	12	0 56	20	22 1	28	9 7
5	22 47	13	4 N. 38	21	19 55	29	13 26
6	23 6	14	9 57	22	16 57	30	17 15
7	22 3	15	14 41	23	13 19		
8	19 39	16	18 34	24	9 13		

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for BREST *add* 18 m. DEVONPORT *add* 17 m.
* Below zero, or datum to which soundings on charts are reduced.

NOVEMBER, 1899.

WEEK DAY	MONTH DAY	PORTSMOUTH (H.M. Dockyard). High Water MORNING				AFTERNOON				Low Water MORNING				AFTERNOON				DOVER (North pier). MORNING				AFTERNOON				☽'s AGE AT NOON
		H.	M.	F.	I.	H.	M.	F.	I.	H.	M.	F.	I.	H.	M.	F.	I.	H.	M.	F.	I.	H.	M.	F.	I.	
W.	1	9	57	12	4	10	15	12	7	2	48	1	6	3	5	1	2	9	20	16	11	9	39	17	3	27·7
Th.	2	10	33	12	9	10	50	12	11	3	21	0	11	3	38	0	8	9	58	17	7	10	17	17	11	28·7
F.	3	11	8	13	1	11	26	13	2	3	55	0	6	4	13	0	4	10	37	18	1	10	57	18	3	●
S.	4	11	45	13	3	—				4	31	0	3	4	49	0	2	11	17	18	4	11	37	18	5	1·1
S.	5	0	4	13	4	0	24	13	3	5	7	0	2	5	25	0	3	11	58	18	5	—				2·1
M.	6	0	44	13	2	1	4	13	1	5	43	0	4	6	2	0	5	0	19	18	4	0	40	18	3	3·1
Tu.	7	1	24	13	0	1	45	12	10	6	22	0	8	6	42	0	11	1	2	18	1	1	24	17	11	4·1
W.	8	2	8	12	8	2	32	12	5	7	4	1	4	7	27	1	8	1	48	17	8	2	13	17	4	5·1
Th.	9	2	57	12	2	3	24	11	11	7	53	2	0	8	24	2	5	2	38	16	11	3	5	16	6	6·1
F.	10	3	52	11	8	4	22	11	5	9	0	2	10	9	38	3	1	3	33	16	1	4	2	15	8	☽
S.	11	4	55	11	3	5	32	11	2	10	18	3	3	11	0	3	2	4	33	15	4	5	5	15	3	8·1
S.	12	6	9	11	2	6	46	11	4	11	42	3	1	—				5	40	15	4	6	14	15	7	9·1
M.	13	7	22	11	8	7	56	12	0	0	20	2	9	0	53	2	4	6	48	16	0	7	22	16	5	10·1
Tu.	14	8	28	12	3	8	58	12	6	1	20	1	11	1	46	1	6	7	53	16	10	8	22	17	3	11·1
W.	15	9	26	12	9	9	52	13	0	2	12	1	1	2	36	0	9	8	49	17	8	9	15	18	0	12·1
Th.	16	10	16	13	4	10	38	13	4	2	59	0	5	3	21	0	3	9	40	18	3	10	5	18	6	13·1
F.	17	11	0	13	5	11	22	13	6	3	43	0	2	4	5	0	1	10	30	18	7	10	54	18	8	O
S.	18	11	44	13	6	—				4	27	0	0	4	49	0	0	11	18	18	8	11	41	18	7	15·1
S.	19	0	6	13	5	0	28	13	3	5	10	0	1	5	30	0	3	—				0	3	18	5	16·1
M.	20	0	50	13	1	1	11	12	10	5	50	0	5	6	9	0	8	0	25	18	2	0	47	17	11	17·1
Tu.	21	1	31	12	8	1	50	12	6	6	28	0	11	6	47	1	4	1	8	17	8	1	29	17	5	18·1
W.	22	2	10	12	3	2	30	12	0	7	6	1	9	7	25	2	1	1	50	17	1	2	11	16	8	19·1
Th.	23	2	50	11	8	3	10	11	5	7	46	2	5	8	9	2	9	2	32	16	3	2	52	15	10	20·1
F.	24	3	31	11	3	3	54	11	0	8	35	3	2	9	4	3	6	3	13	15	6	3	35	15	1	21·1
S.	25	4	19	10	9	4	46	10	8	9	35	3	9	10	7	3	11	3	59	14	9	4	23	14	5	☾
S.	26	5	15	10	6	5	46	10	5	10	41	3	11	11	16	3	10	4	49	14	3	5	17	14	2	23·1
M.	27	6	18	10	5	6	51	10	6	11	51	3	9	—				5	47	14	2	6	18	14	4	24·1
Tu.	28	7	22	10	9	7	53	11	0	0	25	3	7	0	55	3	4	6	49	14	8	7	20	15	0	25·1
W.	29	8	24	11	3	8	52	11	6	1	22	2	11	1	45	2	6	7	49	15	4	8	15	15	9	26·1
Th.	30	9	16	11	9	9	39	12	1	2	7	2	2	2	28	1	10	8	39	16	2	9	2	16	7	27·1

APPROXIMATE — { RISE 7 20 / FALL 6 10 } (Portsmouth)
APPROXIMATE — { RISE 5 0 / FALL 7 30 } (Dover)

Half mean spring range } 6ft. 9in. (Portsmouth) 9ft. 4in. (Dover)

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	16	20	Add.	9	16	4	Add.	17	14	55	Add.	25	12	54	Add.
2	16	20		10	15	58		18	14	43		26	12	35	
3	16	21		11	15	52		19	14	30		27	12	15	
4	16	20		12	15	44		20	14	16		28	11	55	
5	16	18		13	15	36		21	14	1		29	11	34	
6	16	16		14	15	27		22	13	45		30	11	12	
7	16	13		15	15	17		23	13	29					
8	16	9		16	15	7		24	13	12					

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for Portsmouth add 4 m. | Dover subtract 5 m.

NOVEMBER, 1899.

Week Day	Month Day	Moon's Transit H. M.	Sheerness Morning Time H. M.	Sheerness Morning Height F. I.	Sheerness Afternoon Time H. M.	Sheerness Afternoon Height F. I.	Chatham H.W. Morning Time H. M.	Chatham H.W. Morning Height F. L.	Chatham H.W. Afternoon Time H. M.	Chatham H.W. Afternoon Height F. I.	Chatham L.W. Morning Time H. M.	Chatham L.W. Morning Height F. I.	Chatham L.W. Afternoon Time H. M.	Chatham L.W. Afternoon Height F. I.
W.	1	⊙10 7	11 17	14 9	11 35	15 0	11 25	16 5	11 41	16 9	5 21	1 7	5 42	1 4
Th.	2	10 53	11 52	15 3	—		11 58	17 1	—		6 1	1 2	6 19	1 0
F.	3	11 42	0 9	15 6	0 27	15 8	0 15	17 4	0 33	17 7	6 37	0 11	6 55	0 10
S.	4	0a 34	0 45	15 10	1 3	15 11	0 51	17 9	1 9	17 11	7 13	0 8	7 31	0 7
S.	5	1 30	1 21	16 0	1 39	15 11	1 27	18 0	1 45	17 11	7 49	0 6	8 7	0 6
M.	6	2 27	1 57	15 10	2 15	15 9	2 2	17 10	2 20	17 8	8 25	0 7	8 42	0 8
Tu.	7	3 24	2 34	15 8	2 53	15 6	2 39	17 6	2 59	17 4	8 58	0 10	9 15	1 0
W.	8	4 21	3 14	15 4	3 37	15 1	3 21	17 2	3 44	16 11	9 32	1 2	9 51	1 4
Th.	9	5 15	4 1	14 10	4 27	14 6	4 7	16 7	4 32	16 2	10 11	1 7	10 34	1 10
F.	10	6 8	4 56	14 2	5 27	13 11	4 59	15 9	5 30	15 6	11 0	2 3	11 29	2 8
S.	11	6 59	6 1	13 9	6 39	13 7	6 4	15 4	6 43	15 3	—		0 4	2 10
S.	12	7 49	7 19	13 8	8 0	13 10	7 23	15 3	8 3	15 4	0 47	2 9	1 32	2 5
M.	13	8 39	8 37	14 1	9 12	14 5	8 42	15 6	9 19	15 11	2 17	2 0	2 57	1 8
Tu.	14	9 30	9 44	14 9	10 14	15 1	9 53	16 5	10 23	16 9	3 34	1 4	4 5	1 0
W.	15	10 23	10 41	15 4	11 6	15 7	10 50	17 2	11 14	17 5	4 34	0 9	5 3	0 6
Th.	16	11 18	11 30	15 10	11 53	16 0	11 36	17 8	11 58	17 11	5 30	0 4	5 55	0 3
F.	17	m.	—		0 16	16 1	—		0 20	18 2	6 19	0 2	6 42	0 2
S.	18	0 14	0 39	16 2	1 1	16 1	0 42	18 3	1 4	18 1	7 5	0 2	7 28	0 2
S.	19	1 9	1 22	16 2	1 42	16 0	1 26	18 2	1 47	18 1	7 51	0 3	8 12	0 5
M.	20	2 4	2 2	15 10	2 21	15 8	2 7	17 10	2 26	17 6	8 30	0 7	8 47	0 10
Tu.	21	2 55	2 40	15 5	2 59	15 2	2 46	17 2	3 6	16 11	9 4	1 2	9 21	1 5
W.	22	3 44	3 19	14 11	3 39	14 8	3 26	16 8	3 46	16 4	9 37	1 8	9 53	1 11
Th.	23	4 30	4 0	14 4	4 21	14 0	4 6	16 0	4 26	15 7	10 10	2 2	10 28	2 5
F.	24	5 13	4 42	13 9	5 5	13 6	4 46	15 2	5 8	14 11	10 47	2 9	11 8	3 1
S.	25	5 55	5 31	13 3	5 58	13 0	5 33	14 8	6 1	14 5	11 32	3 6	—	
S.	26	6 36	6 28	12 10	7 0	12 10	6 32	14 4	7 5	14 3	0 1	3 9	0 35	3 8
M.	27	7 17	7 35	12 11	8 10	13 0	7 39	14 3	8 13	14 3	1 12	3 6	1 49	3 3
Tu.	28	7 59	8 43	13 2	9 14	13 5	8 47	14 5	9 20	14 8	2 26	3 0	3 2	2 9
W.	29	8 44	9 43	13 8	10 10	13 11	9 50	15 1	10 18	15 6	3 34	2 6	4 4	2 2
Th.	30	9 32	10 35	14 3	10 58	14 6	10 44	15 10	11 7	16 2	4 31	2 0	4 57	1 9

SHEERNESS (H.M. Dockyard). Approximate — { RISE 6 5 / FALL 0 25 }.
CHATHAM (H.M. Dockyard). Approximate — { RISE 0 35 / FALL 0 5 }.

Half mean spring range }   8ft. 0in.   9ft. 1in.

Phases of the moon.

	D.	H.	M.	
New	3	10	27	Morning.
First Quarter	10	1	35	Afternoon.
Full	17	10	18	Morning.
Last Quarter	25	6	35	Morning.
In Perigee	12	0		Noon.
In Apogee	25	2		Morning.

Moon's declination at noon.

M.D.	° ′	M.D.	° ′	M.D.	° ′	M.D.	° ′
1	10 S. 39	9	16 S. 6	17	21 N.20	25	4 N.46
2	14 51	10	11 36	18	22 51	26	0 8
3	18 26	11	6 27	19	23 3	27	4 S. 33
4	21 10	12	0 56	20	22 1	28	9 7
5	22 47	13	4 N.38	21	19 55	29	13 26
6	23 6	14	9 57	22	16 57	30	17 15
7	22 3	15	14 41	23	13 19		
8	19 39	16	18 34	24	9 13		

NOVEMBER, 1899.

Approximate:
- LONDON (London bridge). { Rise 5 30, Fall 7 0 } (H. M.)
- HARWICH (Angel quay). { Rise 6 25, Fall 6 0 } (H. M.)
- HULL (Victoria dock). { Rise 5 40, Fall 6 30 } (H. M.)

Week day	Month day	LONDON Morning Time H.M.	Height F.I.	LONDON Afternoon Time H.M.	Height F.I.	HARWICH Morning Time H.M.	Height F.I.	HARWICH Afternoon Time H.M.	Height F.I.	HULL Morning Time H.M.	Height F.I.	HULL Afternoon Time H.M.	Height F.I.	☽'s age at noon D.
W.	1	0 17	18 10	0 37	19 2	10 28	10 10	10 46	11 0	4 46	18 11	5 3	19 3	27·7
Th.	2	0 55	19 6	1 12	19 8	11 4	11 2	11 22	11 4	5 20	19 7	5 38	19 11	28·7
F.	3	1 29	19 10	1 46	20 0	11 40	11 5	11 58	11 5	5 56	20 1	6 14	20 3	●
S.	4	2 3	20 2	2 21	20 4	—	—	0 16	11 6	6 33	20 5	6 52	20 6	1·1
S.	5	2 39	20 6	2 57	20 6	0 34	11 6	0 52	11 5	7 11	20 7	7 30	20 7	2·1
M.	6	3 15	20 5	3 34	20 4	1 10	11 5	1 29	11 4	7 49	20 6	8 8	20 4	3·1
Tu.	7	3 54	20 3	4 14	20 2	1 49	11 3	2 10	11 1	8 28	20 1	8 49	19 9	4·1
W.	8	4 35	19 11	4 57	19 8	2 32	10 11	2 55	10 9	9 12	19 4	9 37	18 11	5·1
Th.	9	5 21	19 4	5 47	18 11	3 19	10 7	3 44	10 5	10 4	18 6	10 34	18 1	6·1
F.	10	6 15	18 5	6 46	18 1	4 11	10 3	4 41	10 2	11 8	17 8	11 46	17 4	D
S.	11	7 19	17 10	7 55	17 9	5 13	10 1	5 48	10 0	—	—	0 24	17 2	8·1
S.	12	8 34	17 11	9 14	18 1	6 27	10 0	7 7	10 1	1 1	17 1	1 37	17 3	9·1
M.	13	9 51	18 4	10 26	18 7	7 45	10 3	8 20	10 6	2 10	17 8	2 42	18 2	10·1
Tu.	14	10 58	18 11	11 28	19 4	8 51	10 9	9 21	10 11	3 12	18 9	3 41	19 3	11·1
W.	15	11 57	19 9	—	—	9 50	11 1	10 17	11 3	4 9	19 9	4 35	20 1	12·1
Th.	16	0 25	20 1	0 50	20 5	10 42	11 5	11 5	11 7	4 58	20 5	5 21	20 7	13·1
F.	17	1 13	20 6	1 36	20 7	11 28	11 8	11 51	11 9	5 44	20 9	6 7	20 10	○
S.	18	1 59	20 8	2 20	20 9	—	—	0 13	11 8	6 30	20 11	6 53	20 10	15·1
S.	19	2 40	20 10	3 0	20 8	0 35	11 7	0 56	11 6	7 15	20 9	7 35	20 6	16·1
M.	20	3 20	20 5	3 40	20 3	1 16	11 5	1 36	11 3	7 54	20 3	8 14	20 0	17·1
Tu.	21	4 0	20 0	4 20	19 9	1 56	11 1	2 16	10 11	8 34	19 7	8 54	19 2	18·1
W.	22	4 40	19 6	5 0	19 2	2 36	10 9	2 56	10 6	9 14	18 8	9 35	18 3	19·1
Th.	23	5 20	18 9	5 40	18 4	3 16	10 4	3 36	10 2	9 56	17 9	10 18	17 4	20·1
F.	24	6 1	18 0	6 24	17 7	3 57	10 0	4 19	9 10	10 43	17 0	11 12	16 8	21·1
S.	25	6 49	17 3	7 16	17 1	4 43	9 9	5 8	9 9	11 42	16 4	—	—	☾
S.	26	7 45	16 11	8 16	17 0	5 37	9 7	6 8	9 6	0 13	16 0	0 44	16 0	23·1
M.	27	8 50	17 1	9 25	17 2	6 43	9 7	7 18	9 8	1 15	16 0	1 45	16 1	24·1
Tu.	28	9 58	17 4	10 29	17 6	7 51	9 9	8 22	9 11	2 15	16 4	2 44	16 8	25·1
W.	29	10 58	17 9	11 25	18 0	8 51	10 1	9 18	10 3	3 12	17 2	3 39	17 8	26·1
Th.	30	11 51	18 5	—	—	9 43	10 5	10 7	10 8	4 4	18 1	4 27	18 6	27·1

Half mean spring range: London 10ft. 4in. — Harwich 5ft. 9in. — Hull 10ft. 5in.

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	16	20	Add.	9	16	4	Add.	17	14	55	Add.	25	12	54	Add.
2	16	20		10	15	58		18	14	43		26	12	35	
3	16	21		11	15	52		19	14	30		27	12	15	
4	16	20		12	15	44		20	14	16		28	11	55	
5	16	18		13	15	36		21	14	1		29	11	34	
6	16	16		14	15	27		22	13	45		30	11	12	
7	16	13		15	15	17		23	13	29					
8	16	9		16	15	7		24	13	12					

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for LONDON 0 m. | HARWICH *subtract* 5 m. | HULL *add* 1 m.

NOVEMBER, 1899.

Week Day	Month Day	Moon's Transit	SUNDERLAND (North dock). Approximate {Rise 0 5 / Fall 0 25} Morning Time H.M.	Height F.L.	Afternoon Time H.M.	Height F.L.	NORTH SHIELDS (Low lighthouse). Approximate {Rise 5 40 / Fall 6 45} Morning Time H.M.	Height F.L.	Afternoon Time H.M.	Height F.L.	LEITH (East pier). Approximate {Rise 6 0 / Fall 6 15} Morning Time H.M.	Height F.L.	Afternoon Time H.M.	Height F.L.
W.	1	10m 7	1 39	12 9	1 58	13 0	1 45	12 10	2 2	13 2	0 39	14 4	0 57	14 9
Th.	2	10 53	2 16	13 3	2 34	13 6	2 19	13 6	2 35	13 9	1 15	15 1	1 33	15 5
F.	3	11 42	2 52	13 8	3 10	13 10	2 52	13 11	3 9	14 1	1 50	15 8	2 7	15 10
S.	4	0a34	3 27	14 0	3 44	14 2	3 26	14 3	3 44	14 4	2 24	16 0	2 41	16 1
S.	5	1 30	4 2	14 3	4 20	14 2	4 3	14 4	4 22	14 3	2 59	16 0	3 17	15 11
M.	6	2 27	4 38	14 1	4 57	13 11	4 41	14 1	5 1	13 11	3 35	15 10	3 55	15 8
Tu.	7	3 24	5 17	13 8	5 40	13 5	5 22	13 9	5 44	13 7	4 16	15 6	4 39	15 3
W.	8	4 21	6 5	13 1	6 31	12 10	6 8	13 4	6 33	13 1	5 3	15 0	5 29	14 8
Th.	9	5 15	6 59	12 7	7 28	12 3	7 0	12 10	7 31	12 6	5 57	14 4	6 27	13 11
F.	10	6 8	8 0	12 0	8 34	11 10	8 5	12 1	8 42	11 11	7 0	13 7	7 36	13 5
S.	11	6 59	9 10	11 8	9 50	11 8	9 22	11 10	10 2	11 11	8 14	13 4	8 54	13 3
S.	12	7 49	10 29	11 11	11 3	11 11	10 40	12 1	11 15	12 4	9 34	13 5	10 9	13 8
M.	13	8 39	11 35	12 3	—	—	11 48	12 8	—	—	10 41	14 0	11 10	14 4
Tu.	14	9 30	0 5	12 8	0 33	13 0	0 17	13 0	0 44	13 3	11 38	14 8	—	—
W.	15	10 23	1 0	13 4	1 27	13 8	1 10	13 6	1 34	13 9	0 4	15 0	0 28	15 4
Th.	16	11 18	1 53	13 11	2 17	14 1	1 57	14 0	2 19	14 3	0 52	15 8	1 15	16 0
F.	17	m.	2 40	14 2	3 2	14 3	2 41	14 5	3 3	14 6	1 38	16 3	2 0	16 4
S.	18	0 14	3 23	14 4	3 44	14 5	3 25	14 7	3 46	14 7	2 21	16 5	2 42	16 4
S.	19	1 9	4 4	14 4	4 24	14 2	4 6	14 6	4 26	14 3	3 2	16 2	3 22	15 11
M.	20	2 4	4 44	13 11	5 4	13 7	4 47	14 0	5 8	13 8	3 42	15 7	4 2	15 4
Tu.	21	2 55	5 24	13 3	5 45	12 11	5 29	13 5	5 50	13 2	4 22	15 0	4 43	14 8
W.	22	3 44	6 7	12 7	6 29	12 3	6 11	12 11	6 32	12 7	5 5	14 5	5 27	14 1
Th.	23	4 30	6 51	12 0	7 14	11 8	6 53	12 3	7 16	11 11	5 50	13 9	6 13	13 4
F.	24	5 13	7 38	11 5	8 3	11 4	7 41	11 7	8 9	11 7	6 37	13 0	7 4	12 9
S.	25	5 55	8 30	11 0	8 59	10 10	8 39	11 1	9 11	11 0	7 33	12 6	8 3	12 4
S.	26	6 36	9 31	10 9	10 5	10 9	9 44	11 0	10 17	11 1	8 36	12 4	9 10	12 4
M.	27	7 17	10 37	10 10	11 6	10 11	10 49	11 2	11 20	11 4	9 44	12 5	10 15	12 7
Tu.	28	7 59	11 35	11 2	—	—	11 49	11 6	—	—	10 44	12 9	11 11	13 0
W.	29	8 44	0 3	11 5	0 29	11 9	0 17	11 9	0 42	12 0	11 36	13 3	mid.	13 7
Th.	30	9 32	0 54	12 1	1 17	12 5	1 5	12 3	1 26	12 6	—	—	0 21	13 11

Half mean spring range: 7ft. 2in.   7ft. 4in.   8ft. 2in.

Phases of the moon.

	D.	H.	M.	
New	3	10	27	Morning.
First Quarter	10	1	35	Afternoon.
Full	17	10	18	Morning.
Last Quarter	25	6	35	Morning.
In Perigee	12	0		Noon.
In Apogee	25	2		Morning.

Moon's declination at noon.

M.D.	o	'	M.D.	o	'	M.D.	o	'	M.D.	o	'
1	10 S.	39	9	16 S.	6	17	21 N.	20	25	4 N.	46
2	14	51	10	11	36	18	22	51	26	0	8
3	18	26	11	6	27	19	23	3	27	4 S.	33
4	21	10	12	0	56	20	22	1	28	9	7
5	22	47	13	4 N.	38	21	19	55	29	13	26
6	23	6	14	9	57	22	16	57	30	17	15
7	22	3	15	14	41	23	13	19			
8	19	39	16	18	34	24	9	13			

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for SUNDERLAND add 5 m. | NORTH SHIELDS add 6 m. | LEITH add 13 m.

NOVEMBER, 1899.

WEEK DAY	MONTH DAY	THURSO (near Scrabster pier) Rise 6 30 / Fall 6 0 Morning Time	Morning Height	Afternoon Time	Afternoon Height	GREENOCK (East dock) Rise 6 30 / Fall 6 0 Morning Time	Morning Height	Afternoon Time	Afternoon Height	LIVERPOOL (George pier) Rise 5 35 / Fall 6 50 Morning Time	Morning Height	Afternoon Time	Afternoon Height	D. AGE AT NOON
W.	1	6 54	11 7	7 8	12 0	10 17	9 1	10 36	9 2	9 37	24 3	9 54	25 2	27·7
Th.	2	7 23	12 4	7 39	12 8	10 55	9 3	11 14	9 4	10 11	25 2	10 29	25 10	28·7 ●
F.	3	7 55	12 10	8 12	13 0	11 33	9 5	11 52	9 6	10 47	26 0	11 5	26 1	●
S.	4	8 29	13 1	8 47	13 0	—	—	0 11	9 7	11 23	26 7	11 42	26 6	1·1
S.	5	9 6	12 11	9 25	12 10	0 30	9 8	0 49	9 8	—	—	0 1	26 10	2·1
M.	6	9 45	12 8	10 6	12 5	1 9	9 7	1 29	9 7	0 20	26 1	0 40	26 6	3·1
Tu.	7	10 29	12 1	10 55	11 9	1 49	9 6	2 10	9 6	1 0	25 2	1 21	25 10	4·1
W.	8	11 20	11 5	11 48	11 1	2 33	9 5	2 56	9 3	1 43	24 2	2 6	24 10	5·1
Th.	9	—	—	0 19	10 9	3 21	9 2	3 48	9 0	2 30	23 1	2 57	23 10	6·1
F.	10	0 52	10 6	1 27	10 4	4 17	8 11	4 48	8 9	3 28	22 2	4 1	22 11	☽
S.	11	2 6	10 3	2 49	10 2	5 22	8 8	5 58	8 7	4 38	21 5	5 20	22 8	8·1
S.	12	3 31	10 3	4 9	10 5	6 35	8 6	7 11	8 8	6 2	21 8	6 41	23 3	9·1
M.	13	4 43	10 8	5 12	10 11	7 46	8 10	8 19	9 0	7 16	22 9	7 48	24 4	10·1
Tu.	14	5 39	11 4	6 4	11 9	8 50	9 2	9 19	9 4	8 16	24 3	8 43	25 8	11·1
W.	15	6 27	12 2	6 48	12 7	9 46	9 5	10 12	9 6	9 8	25 6	9 31	26 8	12·1
Th.	16	7 8	12 11	7 28	13 2	10 37	9 6	11 2	9 7	9 54	26 4	10 17	26 10	13·1
F.	17	7 48	13 4	8 8	13 5	11 27	9 8	11 51	9 9	10 40	27 0	11 3	27 1	○
S.	18	8 29	13 4	8 50	13 2	—	—	0 13	9 9	11 25	26 10	11 46	26 10	15·1
S.	19	9 11	12 11	9 32	12 8	0 35	9 9	0 56	9 8	—	—	0 7	26 9	16·1
M.	20	9 53	12 4	10 14	12 0	1 16	9 7	1 36	9 6	0 27	26 1	0 47	25 11	17·1
Tu.	21	10 35	11 7	10 57	11 3	1 56	9 5	2 16	9 3	1 7	24 11	1 26	25 0	18·1
W.	22	11 19	10 11	11 42	10 6	2 35	9 1	2 54	9 0	1 45	23 8	2 4	23 10	19·1
Th.	23	—	—	0 5	10 2	3 14	8 10	3 34	8 9	2 24	22 10	2 45	22 8	20·1
F.	24	0 29	9 11	0 55	9 8	3 55	8 8	4 19	8 6	3 7	21 8	3 31	21 8	21·1
S.	25	1 23	9 6	1 54	9 4	4 44	8 5	5 11	8 3	3 58	20 8	4 28	20 10	☾
S.	26	2 28	9 3	3 4	9 2	5 40	8 2	6 11	8 1	5 1	20 1	5 37	20 8	23·1
M.	27	3 40	9 3	4 14	9 4	6 44	8 1	7 17	8 2	6 12	20 5	6 47	21 1	24·1
Tu.	28	4 44	9 6	5 12	9 8	7 49	8 3	8 19	8 4	7 18	21 2	7 47	22 0	25·1
W.	29	5 38	10 0	6 2	10 4	8 47	8 6	9 13	8 8	8 14	22 1	8 38	22 10	26·1
Th.	30	6 22	10 9	6 40	11 2	9 37	8 10	10 10	8 11	9 0	23 4	9 21	23 10	27·1

Half mean spring range	THURSO 6 ft. 7 in.	GREENOCK 4 ft. 10 in.	LIVERPOOL 13 ft. 9 in.

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	16	20	Add.	9	16	4	Add.	17	14	55	Add.	25	12	54	Add.
2	16	20		10	15	58		18	14	43		26	12	35	
3	16	21		11	15	52		19	14	30		27	12	15	
4	16	20		12	15	44		20	14	16		28	11	55	
5	16	18		13	15	36		21	14	1		29	11	34	
6	16	16		14	15	27		22	13	45		30	11	12	
7	16	13		15	15	17		23	13	29					
8	16	9		16	15	7		24	13	12					

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for THURSO add 14 m. | GREENOCK add 19 m. | LIVERPOOL add 12 m.

NOVEMBER, 1899.

Week Day	Month Day	Moon's Transit H. M.	PEMBROKE (H.M. Dockyard) Approximate Rise 6 10 / Fall 6 20 Morning Time H. M.	Height F. I.	Afternoon Time H. M.	Height F. I.	PORTISHEAD (Dock entr.) Approximate Rise 5 40 / Fall 5 40 Morning Time H. M.	Height F. I.	Afternoon Time H. M.	Height F. I.	HOLYHEAD (Pier) Approximate Rise 6 20 / Fall 6 0 Morning Time H. M.	Height F. I.	Afternoon Time H. M.	Height F. I.
W.	1	10m 7	4 19	20 2	4 39	20 8	5 22	38 0	5 42	38 10	8 32	14 8	8 49	14 11
Th.	2	10 53	4 59	21 1	5 19	21 5	6 2	39 6	6 21	40 1	9 6	15 2	9 23	15 4
F.	3	11 42	5 38	21 8	5 57	21 1	6 39	40 8	6 57	41 2	9 40	15 6	9 57	15 8
S.	4	0a34	6 16	22 1	6 34	22 2	7 15	41 4	7 33	41 5	10 14	15 9	10 31	15 10
S.	5	1 30	6 52	22 2	7 11	22 0	7 51	41 3	8 10	41 0	10 48	15 9	11 6	15 8
M.	6	2 27	7 30	21 10	7 50	21 7	8 29	40 8	8 48	40 4	11 26	15 6	11 48	15 4
Tu.	7	3 24	8 11	21 3	8 34	20 10	9 8	39 11	9 29	39 3	—	—	0 12	15 1
W.	8	4 21	8 57	20 5	9 21	19 1	9 50	38 6	10 13	37 9	0 37	14 10	1 3	14 6
Th.	9	5 15	9 46	19 6	10 13	19 0	10 37	36 10	11 2	35 9	1 31	14 2	2 0	13 10
F.	10	6 8	10 40	18 7	11 9	18 2	11 30	34 10	—	—	2 32	13 6	3 8	13 4
S.	11	6 59	11 41	18 1	—	—	0 2	34 3	0 38	33 9	3 47	13 2	4 28	13 3
S.	12	7 49	0 17	18 2	0 55	18 5	1 17	34 1	1 56	34 8	5 8	13 5	5 44	13 8
M.	13	8 39	1 34	18 11	2 11	19 5	2 35	35 6	3 12	36 8	6 15	13 11	6 44	14 3
Tu.	14	9 30	2 45	20 0	3 16	20 8	3 47	37 9	4 20	38 10	7 12	14 7	7 39	14 11
W.	15	10 23	3 45	21 2	4 13	21 7	4 49	39 9	5 16	40 6	8 4	15 3	8 27	15 6
Th.	16	11 18	4 40	21 11	5 6	22 3	5 42	41 7	6 7	41 7	8 49	15 8	9 11	15 10
F.	17	m.	5 30	22 5	5 54	22 5	6 31	41 11	6 54	42 2	9 33	16 0	9 54	16 0
S.	18	0 14	6 16	22 6	6 38	22 4	7 16	42 1	7 37	41 9	10 14	16 0	10 33	15 11
S.	19	1 9	6 58	22 1	7 17	21 9	7 57	41 2	8 17	40 7	10 52	15 9	11 12	15 6
M.	20	2 4	7 36	21 5	7 55	21 0	8 36	39 11	8 55	39 3	11 33	15 3	11 55	15 0
Tu.	21	2 55	8 15	20 7	8 35	20 1	9 13	38 7	9 31	37 10	—	—	0 17	14 8
W.	22	3 44	8 55	19 7	9 15	19 1	9 49	37 0	10 7	36 2	0 39	14 4	1 1	13 11
Th.	23	4 30	9 35	18 7	9 55	18 1	10 25	35 4	10 44	34 4	1 23	13 7	1 46	13 4
F.	24	5 13	10 15	17 8	10 36	17 3	11 4	33 4	11 26	32 6	2 10	13 0	2 36	12 9
S.	25	5 55	10 59	16 11	11 25	16 9	11 51	31 11	—	—	3 5	12 6	3 36	12 5
S.	26	6 36	11 55	16 8	—	—	0 20	31 4	0 53	31 3	4 9	12 4	4 43	12 4
M.	27	7 17	0 27	16 9	1 1	16 10	1 27	31 5	2 1	31 9	5 17	12 6	5 49	12 8
Tu.	28	7 59	1 35	17 1	2 8	17 6	2 35	32 4	3 9	33 2	6 18	12 10	6 45	13 1
W.	29	8 44	2 39	18 0	3 8	18 6	3 41	34 2	4 11	35 1	7 10	13 4	7 34	13 8
Th.	30	9 32	3 34	19 1	3 59	19 8	4 37	36 1	5 2	37 1	7 56	14 0	8 16	14 4

Half mean spring range	PEMBROKE	PORTISHEAD	HOLYHEAD
	11ft. 3in.	21ft. 0in.	8ft. 0in.

Phases of the moon.

	D.	H.	M.	
New	3	10	27	Morning.
First Quarter	10	1	35	Afternoon.
Full	17	10	18	Morning.
Last Quarter	25	6	35	Morning.
In Perigee	12	0		Noon.
In Apogee	25	2		Morning.

Moon's declination at noon.

M.D.	o '	M.D.	o '	M.D.	o '	M.D.	o '
1	10 S. 39	9	16 S. 6	17	21 N.20	25	4 N.46
2	14 51	10	11 36	18	22 51	26	0 8
3	18 26	11	6 27	19	23 3	27	4 S. 33
4	21 10	12	0 56	20	22 1	28	9 7
5	22 47	13	4 N.38	21	19 55	29	13 26
6	23 6	14	9 57	22	16 57	30	17 15
7	22 3	15	14 41	23	13 19		
8	19 39	16	18 34	24	9 13		

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for PEMBROKE add 20 m. | PORTISHEAD add 11 m. | HOLYHEAD add 18 m.

NOVEMBER, 1899.

Week Day	Month Day	Kingstown (Watering pier). Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	Belfast (New dock). Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	Londonderry (Ship bridge). Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	D. Age at Noon
W.	1	9 31	10 1	9 48	10 3	9 7	8 11	9 24	9 1	6 17	7 0	6 35	7 2	27·7
Th.	2	10 4	10 5	10 20	10 7	9 41	9 2	9 58	9 3	6 53	7 3	7 11	7 4	28·7
F.	3	10 37	10 8	10 54	10 9	10 15	9 4	10 33	9 4	7 29	7 5	7 47	7 6	●
S.	4	11 12	10 10	11 31	10 10	10 51	9 5	11 9	9 5	8 4	7 7	8 21	7 7	1·1
S.	5	11 50	10 9	—	—	11 26	9 4	11 45	9 4	8 38	7 6	8 56	7 5	2·1
M.	6	0 9	10 8	0 29	10 7	—		0 5	9 3	9 14	7 4	9 32	7 2	3·1
Tu.	7	0 51	10 5	1 13	10 3	0 27	9 3	0 51	9 2	9 52	7 0	10 16	6 10	4·1
W.	8	1 37	10 1	2 3	9 11	1 16	9 1	1 43	8 11	10 43	6 8	11 14	6 5	5·1
Th.	9	2 30	9 9	2 59	9 7	2 12	8 9	2 43	8 8	11 50	6 2	—	—	6·1
F.	10	3 31	9 5	4 6	9 4	3 15	8 6	3 49	8 5	0 30	5 11	1 13	5 11	☽
S.	11	4 44	9 3	5 21	9 2	4 25	8 4	5 2	8 4	1 57	5 11	2 39	6 0	8·1
S.	12	5 57	9 4	6 30	9 6	5 39	8 4	6 14	8 5	3 16	6 3	3 47	6 6	9·1
M.	13	7 2	9 9	7 32	10 0	6 47	8 6	7 18	8 7	4 14	6 9	4 38	6 11	10·1
Tu.	14	8 2	10 1	8 32	10 3	7 46	8 9	8 13	8 11	5 2	7 1	5 26	7 3	11·1
W.	15	9 0	10 5	9 26	10 7	8 38	9 1	9 2	9 3	5 50	7 5	6 13	7 6	12·1
Th.	16	9 48	10 9	10 9	10 10	9 25	9 4	9 47	9 5	6 36	7 7	6 59	7 8	13·1
F.	17	10 30	10 11	10 51	11 1	10 9	9 6	10 31	9 6	7 22	7 8	7 44	7 9	○
S.	18	11 12	11 0	11 33	10 11	10 52	9 5	11 12	9 5	8 5	7 9	8 25	7 8	15·1
S.	19	11 54	10 9	—	—	11 32	9 4	11 52	9 3	8 44	7 6	9 3	7 4	16·1
M.	20	0 15	10 7	0 36	10 5	—		0 12	9 2	9 22	7 1	9 41	6 11	17·1
Tu.	21	0 57	10 3	1 18	10 0	0 33	9 1	0 55	9 0	9 59	6 9	10 18	6 6	18·1
W.	22	1 39	9 10	2 1	9 8	1 18	8 11	1 41	8 9	10 39	6 4	11 4	6 1	19·1
Th.	23	2 23	9 6	2 45	9 4	2 4	8 7	2 28	8 5	11 32	5 10	—	—	20·1
F.	24	3 8	9 2	3 34	9 0	2 52	8 3	3 18	8 2	0 3	5 8	0 36	5 6	21·1
S.	25	4 3	8 10	4 33	8 9	3 45	8 1	4 14	8 1	1 10	5 5	1 45	5 5	☽
S.	26	5 4	8 8	5 35	8 8	4 45	8 0	5 16	8 0	2 20	5 5	2 54	5 7	23·1
M.	27	6 5	8 9	6 35	8 11	5 47	8 0	6 18	8 0	3 25	5 9	3 53	5 11	24·1
Tu.	28	7 4	9 1	7 32	9 3	6 49	8 0	7 18	8 1	4 17	6 1	4 40	6 3	25·1
W.	29	7 59	9 5	8 25	9 7	7 44	8 3	8 8	8 5	5 1	6 5	5 21	6 6	26·1
Th.	30	8 49	9 9	9 13	9 11	8 30	8 7	8 51	8 9	5 41	6 8	6 1	6 10	27·1

Half mean spring range { 5ft. 6in. | 4ft. 9in. | 3ft. 10in.

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	16	20	Add.	9	16	4	Add.	17	14	55	Add.	25	12	54	Add.
2	16	20		10	15	58		18	14	43		26	12	35	
3	16	21		11	15	52		19	14	30		27	12	15	
4	16	20		12	15	44		20	14	16		28	11	55	
5	16	18		13	15	36		21	14	1		29	11	34	
6	16	16		14	15	27		22	13	45		30	11	12	
7	16	13		15	15	17		23	13	29					
8	16	9		16	15	7		24	13	12					

The times of high water are given for Mean time at place; if Dublin or Railway time be required,—for KINGSTOWN *subtract* 1 m. for Dublin time. | BELFAST *subtract* 2 m. | LONDONDERRY *add* 4 m.

NOVEMBER, 1899.

Week Day	Month Day	Moon's Transit H.M.	Sligo Bay (Mullaghmore) Morning Time H.M.	Height F.L.	Afternoon Time H.M.	Height F.L.	Galway (Nimmo pier) Morning Time H.M.	Height F.L.	Afternoon Time H.M.	Height F.L.	Queenstown (Scott's wharf) Morning Time H.M.	Height F.L.	Afternoon Time H.M.	Height F.L.
			Rise 6 10 / Fall 6 20				Rise 6 30 / Fall 6 0				Rise 6 5 / Fall 6 25			
W.	1	10m 7	3 35	10 0	3 51	10 3	2 53	13 0	3 10	13 4	3 11	10 6	3 30	10 9
Th.	2	10 53	4 8	10 6	4 25	10 8	3 27	13 8	3 45	13 11	3 49	11 0	4 8	11 2
F.	3	11 42	4 43	10 10	5 1	11 0	+ 3	14 2	4 20	14 4	4 26	11 1	4 45	11 6
S.	4	0a 34	5 19	11 1	5 37	11 1	4 38	14 6	4 57	14 7	5 4	11 6	5 23	11 7
S.	5	1 30	5 55	11 0	6 14	10 10	5 16	14 6	5 36	14 5	5 42	11 7	6 2	11 6
M.	6	2 27	6 34	10 8	6 55	10 6	5 56	14 3	6 16	14 1	6 22	11 5	6 42	11 4
Tu.	7	3 24	7 16	10 3	7 39	9 11	6 38	13 10	7 2	13 6	7 3	11 2	7 26	10 11
W.	8	4 21	8 4	9 8	8 32	9 5	7 28	13 2	7 55	12 9	7 49	10 8	8 12	10 5
Th.	9	5 15	9 4	9 2	9 39	9 0	8 24	12 4	8 55	11 11	8 37	10 2	9 4	10 0
F.	10	6 8	10 17	8 10	10 56	8 9	9 28	11 8	10 4	11 6	9 33	9 10	10 6	9 8
S.	11	6 59	11 35	8 10	—		10 44	11 7	11 23	11 9	10 43	9 7	11 21	9 8
S.	12	7 49	0 13	8 11	0 48	9 1	11 59	12 0	—		11 57	9 10	—	
M.	13	8 39	1 21	9 4	1 51	9 7	0 32	12 2	1 2	12 9	0 33	10 0	1 8	10 3
Tu.	14	9 30	2 18	9 11	2 43	10 2	1 29	13 2	1 56	13 6	1 42	10 6	2 12	10 9
W.	15	10 23	3 7	10 5	3 29	10 8	2 22	13 10	2 47	14 1	2 40	11 0	3 6	11 3
Th.	16	11 18	3 51	10 11	4 13	11 1	3 10	14 4	3 33	14 6	3 31	11 5	3 55	11 7
F.	17	m.	4 35	11 2	4 57	11 3	3 56	14 8	4 18	14 9	4 19	11 8	4 43	11 9
S.	18	0 14	5 19	11 3	5 40	11 4	4 39	14 9	5 0	14 9	5 6	11 9	5 27	11 8
S.	19	1 9	6 0	11 0	6 20	10 9	5 21	14 6	5 42	14 3	5 48	11 7	6 8	11 5
M.	20	2 4	6 40	10 6	7 0	10 2	6 3	14 0	6 23	13 8	6 28	11 3	6 48	11 0
Tu.	21	2 55	7 20	9 10	7 41	9 6	6 43	13 4	7 4	12 11	7 8	10 9	7 28	10 6
W.	22	3 44	8 2	9 3	8 24	9 0	7 26	12 6	7 48	12 2	7 47	10 3	8 5	10 0
Th.	23	4 30	8 48	8 9	9 14	8 6	8 10	11 9	8 33	11 4	8 24	9 9	8 45	9 6
F.	24	5 13	9 43	8 4	10 14	8 3	8 57	11 0	9 24	10 8	9 7	9 4	9 30	9 2
S.	25	5 55	10 45	8 2	11 17	8 1	9 53	10 7	10 25	10 6	9 56	9 0	10 24	8 11
S.	26	6 36	11 49	8 2	—		11 0	10 7	11 33	10 8	10 56	8 11	11 30	8 11
M.	27	7 17	0 21	8 3	0 52	8 4	—		0 4	10 0	—		0 3	9 0
Tu.	28	7 59	1 22	8 6	1 51	8 8	0 34	11 1	1 3	11 4	0 35	9 2	1 5	9 4
W.	29	8 44	2 17	8 11	2 40	9 2	1 29	11 8	1 52	12 0	1 35	9 6	2 3	9 9
Th.	30	9 32	3 1	9 5	3 20	9 9	2 14	12 4	2 36	12 8	2 29	10 0	2 53	10 3
Half mean spring range.			5 ft. 7 in.				7 ft. 5 in.				5 ft. 10 in.			

Phases of the moon.

	D.	H.	M.	
New	3	10	27	Morning.
First Quarter	10	1	35	Afternoon.
Full	17	10	18	Morning.
Last Quarter	25	6	35	Morning.
In Perigee	12	0		Noon.
In Apogee	25	2		Morning.

Moon's declination at noon.

M.D.	o	'	M.D.	o	'	M.D.	o	'	M.D.	o	'
1	10 S.	39	9	16 S.	6	17	21 N.	20	25	4 N.	46
2	14	51	10	11	36	18	22	51	26	0	8
3	18	26	11	6	27	19	23	3	27	4 S.	33
4	21	10	12	0	56	20	22	1	28	9	7
5	22	47	13	4 N.	38	21	19	55	29	13	26
6	23	6	14	9	57	22	16	57	30	17	15
7	22	3	15	14	41	23	13	19			
8	19	39	16	18	34	24	9	13			

The times of high water are given for Mean time at place; if Dublin or Railway time be required,—for SLIGO BAY *add* 9 m. | GALWAY *add* 11 m. | QUEENSTOWN *add* 8 m.

NOVEMBER, 1899.

Week Day.	Month Day.	WATERFORD (Duncannon fort). Morning. Time H.M.	Height F.I.	Afternoon. Time H.M.	Height F.I.	D's Age at Noon.
W.	1	3 29	11 4	3 49	11 7	27·7
Th.	2	4 9	11 9	4 29	11 11	28·7 ●
F.	3	4 49	12 0	5 8	12 1	
S.	4	5 26	12 2	5 44	12 3	1·1
S.	5	6 3	12 3	6 23	12 3	2·1
M.	6	6 43	12 2	7 3	12 1	3·1
Tu.	7	7 24	12 0	7 45	11 1C	4·1
W.	8	8 7	11 8	8 29	11 6	5·1
Th.	9	8 53	11 3	9 20	11 C	6·1
F.	10	9 50	10 9	10 25	10 7	7·1 D
S.	11	11 3	10 6	11 39	10 5	8·1
S.	12	—	—	0 12	10 6	9·1
M.	13	0 45	10 9	1 18	11 C	10·1
Tu.	14	1 51	11 3	2 24	11 6	11·1
W.	15	2 55	11 9	3 24	12 0	12·1
Th.	16	3 51	12 2	4 17	12 4	13·1
F.	17	4 42	12 5	5 5	12 5	O
S.	18	5 26	12 4	5 47	12 4	15·1
S.	19	6 8	12 3	6 29	12 2	16·1
M.	20	6 50	12 0	7 10	11 10	17·1
Tu.	21	7 29	11 8	7 47	11 6	18·1
W.	22	8 5	11 3	8 23	11 0	19·1
Th.	23	8 41	10 9	8 59	10 6	20·1
F.	24	9 21	10 4	9 47	10 2	21·1
S.	25	10 16	10 0	10 46	9 1C	☾
S.	26	11 16	9 9	11 46	9 8	23·1
M.	27	—	—	0 16	9 9	24·1
Tu.	28	0 46	9 11	1 15	10 1	25·1
W.	29	1 44	10 4	2 13	10 7	26·1
Th.	30	2 41	10 10	3 8	11 1	27·1

APPROXIMATE — { RISE 6 5 ; FALL 6 20 } (H. M.)

Half mean spring range } 6ft. 2in.

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	16	20	Add.	9	16	4	Add.	17	14	55	Add.	25	12	54	Add.
2	16	20		10	15	58		18	14	43		26	12	35	
3	16	21		11	15	52		19	14	30		27	12	15	
4	16	20		12	15	44		20	14	16		28	11	55	
5	16	18		13	15	36		21	14	1		29	11	34	
6	16	16		14	15	27		22	13	45		30	11	12	
7	16	13		15	15	17		23	13	29					
8	16	9		16	15	7		24	13	12					

The times of high water are given for Mean time at place ; if Dublin or Railway time be required,—for WATERFORD add 3 m.

DECEMBER, 1899.

WEEK DAY	MONTH DAY	MOON'S TRANSIT H. M.	BREST (Entr. of Dockyard basin) Approximate Rise 6 10 / Fall 6 20				DEVONPORT (H.M. Dockyard) High Water — Approximate Rise 6 10 / Fall 6 10				Low Water			
			MORNING Time H. M.	Height F. I.	AFTERNOON Time H. M.	Height F. I.	MORNING Time H. M.	Height F. I.	AFTERNOON Time H. M.	Height F. I.	MORNING Time H. M.	Height F. I.	AFTERNOON Time H. M.	Height F. I.
F.	1	10ᵐ23	2 6	16 9	2 27	17 4	3 52	14 1	4 15	14 4	10 8	1 11	10 30	1 6
S.	2	11 18	2 48	17 10	3 8	18 3	+ 38	14 7	5 0	14 9	10 52	1 2	11 14	1 0
S.	3	0ᵃ16	3 29	18 6	3 50	18 8	5 21	15 2	5 43	15 0	11 36	0 5	11 58	0 6
M.	4	1 15	4 11	18 10	4 33	18 11	6 5	15 6	6 27	15 1	—	—	0 20	*0
Tu.	5	2 14	4 55	18 11	5 17	18 10	6 49	15 8	7 11	14 10	0 42	0 5	1 3	*0 1
W.	6	3 10	5 40	18 8	6 3	18 5	7 33	15 8	7 55	14 9	1 24	0 9	1 46	0 1
Th.	7	4 4	6 27	18 1	6 52	17 8	8 17	15 6	8 39	14 5	2 8	1 0	2 30	0 6
F.	8	4 56	7 18	17 2	7 44	16 8	9 3	14 11	9 29	13 10	2 53	1 9	3 17	1 4
S.	9	5 46	8 11	16 1	8 40	15 8	9 56	14 3	10 23	13 3	3 41	2 7	4 2	2 3
S.	10	6 36	9 10	15 4	9 43	15 3	10 51	13 8	11 22	12 11	4 33	3 4	5 4	3 0
M.	11	7 25	10 20	15 1	10 57	15 2	11 57	13 5	—	—	5 39	3 10	6 14	3 5
Tu.	12	8 17	11 33	15 3	—	—	0 34	13 1	1 11	13 6	6 49	3 8	7 24	3 2
W.	13	9 9	0 8	15 5	0 42	15 9	1 47	13 5	2 21	13 7	7 59	3 1	8 35	2 8
Th.	14	10 3	1 16	16 2	1 42	16 7	2 53	13 10	3 23	14 1	9 9	2 5	9 40	2 1
F.	15	10 58	2 6	17 0	2 30	17 5	3 51	14 5	4 17	14 5	10 7	1 8	10 32	1 5
S.	16	11 53	2 53	17 9	3 15	18 0	4 42	14 10	5 6	14 8	10 57	0 11	11 21	1 0
S.	17	m.	3 36	18 1	3 57	18 2	5 29	15 2	5 51	14 8	11 44	0 5	—	—
M.	18	0 45	4 17	18 1	4 37	18 0	6 12	15 3	6 32	14 8	0 5	0 10	0 25	0 2
Tu.	19	1 35	4 56	17 11	5 14	17 9	6 50	15 3	7 6	14 4	0 44	0 11	1 3	0 4
W.	20	2 23	5 32	17 7	5 50	17 5	7 22	15 0	7 38	14 0	1 21	1 3	1 38	0 8
Th.	21	3 7	6 8	17 2	6 26	16 10	7 54	14 7	8 10	13 6	1 54	1 10	2 10	1 3
F.	22	3 50	6 44	16 5	7 3	16 0	8 26	14 0	8 42	12 11	2 25	2 5	2 40	2 1
S.	23	4 31	7 22	15 7	7 41	15 2	8 59	13 4	9 18	12 6	2 56	3 3	3 12	3 0
S.	24	5 12	8 1	14 9	8 22	14 4	9 37	12 9	9 57	12 0	3 29	3 11	3 47	3 8
M.	25	5 53	8 46	14 0	9 13	13 8	10 18	12 3	10 43	11 9	4 6	4 7	4 29	4 5
Tu.	26	6 36	9 44	13 7	10 18	13 6	11 10	11 11	11 41	11 10	4 57	4 11	5 28	4 10
W.	27	7 21	10 54	13 7	11 30	13 9	—	—	0 18	12 0	6 5	5 0	6 34	4 9
Th.	28	8 10	—	—	0 6	14 1	0 55	12 2	1 32	12 4	7 9	4 7	7 45	4 2
F.	29	9 3	0 39	14 6	1 10	15 0	2 8	12 8	2 41	12 11	8 22	3 9	8 58	3 4
S.	30	9 59	1 38	15 8	2 3	16 5	3 13	13 6	3 44	13 8	9 31	2 9	10 1	2 6
S.	31	10 58	2 27	17 1	2 51	17 9	4 12	14 4	4 38	14 3	10 28	1 7	10 54	1 6
Half mean spring range			**9ft. 6in.**				**7ft. 9in.**							

Phases of the moon.

	D.	H.	M.	
New	3	0	48	Morning.
First Quarter	9	9	3	Afternoon.
Full	17	1	31	Morning.
Last Quarter	25	3	57	Morning.
In Perigee		7	6	Morning.
In Apogee		22	11	Afternoon.

Moon's declination at noon.

M.D.	°	'	M.D.	°	'	M.D.	°	'	M.D.	°	'
1	20 S.	19	9	2 S.	7	17	22 N.	31	25	7 S.	30
2	22	21	10	3 N.	24	18	20	46	26	11	51
3	23	7	11	8	42	19	18	4	27	15	49
4	22	27	12	13	30	20	14	38	28	19	10
5	20	22	13	17	32	21	10	38	29	21	38
6	17	0	14	20	36	22	6	17	30	22	58
7	12	38	15	22	29	23	1	43	31	22	54
8	7	34	16	23	7	24	2 S.	55			

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for BREST *add* 18 m.   DEVONPORT *add* 17 m.
* Below zero, or datum to which soundings on charts are reduced.

DECEMBER, 1899.

Week Day	Month Day	Portsmouth (H.M. Dockyard) High Water Morning Time (H. M.)	Height (F. L.)	High Water Afternoon Time (H. M.)	Height (F. L.)	Low Water Morning Time (H. M.)	Height (F. L.)	Low Water Afternoon Time (H. M.)	Height (F. L.)	Dover (North pier) Morning Time (H. M.)	Height (F. L.)	Afternoon Time (H. M.)	Height (F. L.)	☾'s Age at Noon D.
F.	1	10 1	12 4	10 22	12 7	2 49	1 6	3 9	1 2	9 25	16 11	9 48	17 3	28·1
S.	2	10 43	12 9	11 4	12 11	3 29	0 11	3 49	0 8	10 10	17 7	10 32	17 11	29·1
S.	3	11 25	13 1	11 47	13 3	4 9	0 6	4 30	0 4	10 55	18 2	11 19	18 4	●
M.	4	—	—	0 9	13 4	4 51	0 3	5 12	0 2	11 43	18 5	—	—	1·5
Tu.	5	0 32	13 4	0 55	13 4	5 33	0 2	5 54	0 2	0 7	18 6	0 31	18 7	2·5
W.	6	1 18	13 3	1 41	13 2	6 16	0 3	6 38	0 5	0 55	18 7	1 19	18 6	3·5
Th.	7	2 4	13 1	2 28	13 0	7 1	0 8	7 24	1 0	1 44	18 4	2 9	18 2	4·5
F.	8	2 53	12 9	3 18	12 6	7 48	1 4	8 15	1 8	2 34	17 10	2 59	17 6	5·5
S.	9	3 43	12 4	4 9	12 1	8 44	2 0	9 16	2 5	3 24	17 1	3 49	16 8	☽
S.	10	4 36	11 10	5 5	11 8	9 51	2 9	10 27	2 10	4 15	16 3	4 42	15 11	7·5
M.	11	5 36	11 6	6 10	11 4	11 4	2 11	11 42	2 11	5 11	15 8	5 41	15 6	8·5
Tu.	12	6 46	11 4	7 22	11 6	—	—	0 20	2 10	6 12	15 6	6 46	15 8	9·5
W.	13	7 58	11 8	8 33	11 10	0 54	2 7	1 24	2 3	7 22	15 11	7 57	16 3	10·5
Th.	14	9 5	12 0	9 34	12 3	1 52	1 11	2 19	1 7	8 29	16 7	8 57	16 10	11·5
F.	15	10 1	12 6	10 26	12 8	2 44	1 4	3 8	1 1	9 24	17 1	9 50	17 4	12·5
S.	16	10 49	12 9	11 11	12 10	3 31	0 10	3 54	0 9	10 15	17 6	10 39	17 8	13·5
S.	17	11 33	12 11	11 54	12 11	4 16	0 8	4 37	0 7	11 2	17 9	11 25	17 10	○
M.	18	—	—	0 15	13 0	4 57	0 6	5 17	0 6	11 47	17 11	—	—	15·5
Tu.	19	0 35	12 11	0 54	12 10	5 36	0 7	5 54	0 8	0 8	17 10	0 28	17 10	16·5
W.	20	1 13	12 8	1 31	12 7	6 12	0 9	6 29	0 11	0 48	17 9	1 8	17 7	17·5
Th.	21	1 49	12 6	2 7	12 5	6 47	1 2	7 5	1 5	1 28	17 6	1 48	17 4	18·5
F.	22	2 26	12 3	2 45	12 1	7 23	1 8	7 41	1 11	2 7	17 2	2 26	16 10	19·5
S.	23	3 4	11 11	3 22	11 9	7 59	2 2	8 19	2 6	2 45	16 7	3 3	16 3	20·5
S.	24	3 40	11 6	3 58	11 4	8 41	2 10	9 5	3 2	3 21	15 11	3 39	15 7	21·5
M.	25	4 18	11 2	4 42	10 11	9 31	3 5	10 0	3 8	3 59	15 3	4 21	14 11	☾
Tu.	26	5 8	10 9	5 37	10 7	10 31	3 9	11 4	3 10	4 45	14 7	5 12	14 4	23·5
W.	27	6 9	10 6	6 43	10 5	11 40	3 10	—	—	5 40	14 3	6 11	14 2	24·5
Th.	28	7 18	10 7	7 53	10 10	0 17	3 9	0 52	3 6	6 44	14 5	7 19	14 9	25·5
F.	29	8 28	11 1	9 0	11 5	1 24	3 1	1 53	2 8	7 54	15 2	8 26	15 8	26·5
S.	30	9 30	11 9	9 57	12 2	2 18	2 3	2 43	1 10	8 54	16 2	9 20	16 8	27·5
S.	31	10 22	12 6	10 46	12 9	3 6	1 5	3 29	1 0	9 46	17 1	10 12	17 7	28·5

Half mean spring range	6ft. 9in.	9ft. 4in.

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	10	50	Add	9	7	30	Add	17	3	44	Add	25	0	15	Sub.
2	10	27		10	7	3		18	3	14		26	0	45	
3	10	3		11	6	35		19	2	45		27	1	14	
4	9	39		12	6	8		20	2	15		28	1	44	
5	9	14		13	5	39		21	1	45		29	2	13	
6	8	49		14	5	11		22	1	15		30	2	42	
7	8	23		15	4	42		23	0	45		31	3	11	
8	7	57		16	4	13		24	0	15					

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for PORTSMOUTH *add* 4 m. | DOVER *subtract* 5 m.

H

DECEMBER, 1899.

Week Day	Month Day	Moon's Transit	Sheerness (H.M. Dockyard) Approximate Rise 6 5 Fall 6 25 — High Water Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	Chatham (H.M. Dockyard) High Water Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	Low Water Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.
F.	1	10 23	11 19	14 9	11 40	15 0	11 27	16 5	11 46	16 8	5 20	1 6	5 43	1 4
S.	2	11 18	—		noon	15 3	—		0 6	17 0	6 5	1 2	6 27	1 1
S.	3	0a 16	0 20	15 6	0 41	15 8	0 26	17 4	0 47	17 7	6 48	1 0	7 9	0 10
M.	4	1 15	1 2	15 10	1 23	15 11	1 8	17 9	1 29	17 11	7 30	0 8	7 51	0 7
Tu.	5	2 14	1 44	15 11	2 5	16 0	1 50	18 0	2 10	17 11	8 12	0 6	8 32	0 5
W.	6	3 10	2 26	15 11	2 48	15 11	2 31	17 10	2 54	17 9	8 52	0 6	9 12	0 7
Th.	7	4 4	3 10	15 10	3 33	15 8	3 17	17 8	3 40	17 6	9 32	0 8	9 51	0 9
F.	8	4 56	3 57	15 5	4 22	15 2	4 3	17 4	4 27	17 1	10 11	0 11	10 32	1 1
S.	9	5 46	4 48	14 11	5 15	14 8	4 52	16 8	5 18	16 4	10 55	1 1	11 20	1 8
S.	10	6 36	5 44	14 5	6 15	14 2	5 46	16 1	6 17	15 10	11 47	2 1	—	
M.	11	7 25	6 49	13 11	7 24	13 11	6 52	15 8	7 28	15 6	0 19	2 4	0 56	2 3
Tu.	12	8 17	8 1	13 11	8 37	14 0	8 4	15 5	8 45	15 5	1 36	2 1	2 16	1 11
W.	13	9 9	9 12	14 2	9 46	14 4	9 18	15 9	9 54	15 11	2 56	1 9	3 33	1 7
Th.	14	10 3	10 18	14 6	10 47	14 9	10 28	16 2	10 57	16 6	+ 7	1 5	4 39	1 7
F.	15	10 58	11 14	15 0	11 39	15 2	11 22	16 9	11 46	16 11	5 10	1 2	5 38	1 1
S.	16	11 53	—		0 3	15 7	—		0 9	17 2	6 4	1 0	6 29	1 0
S.	17	m.	0 25	15 6	0 47	15 6	0 31	17 4	0 53	17 5	6 53	1 0	7 15	1 0
M.	18	0 45	1 8	15 7	1 29	15 7	1 15	17 6	1 36	17 6	7 37	1 0	7 58	1 0
Tu	19	1 35	1 49	15 6	2 8	15 5	1 56	17 5	2 14	17 4	8 18	1 0	8 36	1 1
W.	20	2 23	2 27	15 4	2 44	15 3	2 32	17 2	2 50	17 0	8 53	1 2	9 9	1 3
Th.	21	3 7	3 0	15 2	3 18	15 0	3 8	16 11	3 26	16 9	9 24	1 5	9 39	1 7
F.	22	3 50	3 37	14 10	3 56	14 8	3 44	16 4	4 2	16 2	9 54	1 9	10 9	1 10
S.	23	4 31	4 15	14 5	4 34	14 2	4 20	16 2	4 38	15 11	10 25	2 0	10 42	2 2
S.	24	5 12	4 53	14 0	5 12	13 10	4 56	15 7	5 14	15 3	10 59	2 5	11 16	2 9
M.	25	5 53	5 32	13 7	5 55	13 4	5 34	15 0	5 57	14 9	11 35	3 1	11 58	3 4
Tu.	26	6 36	6 22	13 1	6 52	12 11	6 25	14 7	6 56	14 5	—		0 27	3 6
W.	27	7 21	7 25	12 11	8 0	12 11	7 29	14 4	8 3	14 4	1 0	3 6	1 37	3 4
Th	28	8 10	8 35	13 0	9 10	13 3	8 38	14 4	9 15	14 6	2 14	3 1	2 52	2 11
F.	29	9 3	9 44	13 6	10 16	13 10	9 52	15 0	10 25	15 3	3 30	2 8	+ 5	2 5
S.	30	9 59	10 49	14 2	11 19	14 6	10 55	15 8	11 21	16 0	+ 37	2 2	5 6	1 10
S.	31	10 58	11 36	14 10	11 59	15 0	11 44	16 6	—		5 34	1 6	6 1	1 3

Half mean spring range.	8ft. 0in.	9ft. 1in.

Phases of the moon.				*Moon's declination at noon.*

	D.	H.	M.		M.D.	o	M.D.	o	M.D.	o	M.D.	o
New	3	0	48	Morning.	1	20 S. 19	9	2 S. 7	17	22 N. 31	25	7 S. 30
First Quarter	9	9	3	Afternoon.	2	22 21	10	3 N.24	18	20 46	26	11 51
Full	17	1	31	Morning.	3	23 7	11	8 42	19	18 4	27	15 49
Last Quarter	25	3	57	Morning.	4	22 27	12	13 30	20	14 38	28	19 10
					5	20 22	13	17 32	21	10 38	29	21 38
					6	17 0	14	20 36	22	6 17	30	22 58
In Perigee		7	6	Morning.	7	12 38	15	22 29	23	1 43	31	22 54
In Apogee		22	11	Afternoon.	8	7 34	16	23 7	24	2 S. 55		

DECEMBER, 1899.

Week Day	Month Day	LONDON (London bridge) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	HARWICH (Angel quay) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	HULL (Victoria dock) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	Moon's age at Noon D.
F.	1	0 16	18 10	0 38	19 2	10 29	10 10	10 51	11 0	4 47	18 11	5 7	19 3	28·1
S.	2	0 59	19 5	1 20	19 8	11 13	11 2	11 34	11 4	5 28	19 7	5 49	19 10	29·1
S.	3	1 41	19 10	2 1	20 0	11 54	11 5	—	—	6 11	20 1	6 33	20 4	●
M.	4	2 21	20 3	2 42	20 6	0 14	11 5	0 35	11 6	6 55	20 6	7 17	20 7	1·5
Tu.	5	3 3	20 6	3 24	20 7	0 57	11 6	1 19	11 5	7 39	20 8	8 1	20 9	2·5
W.	6	3 46	20 7	4 9	20 7	1 41	11 5	2 4	11 4	8 23	20 8	8 46	20 6	3·5
Th.	7	4 32	20 6	4 55	20 4	2 27	11 3	2 51	11 2	9 9	20 2	9 33	19 10	4·5
F.	8	5 18	20 1	5 42	19 9	3 15	11 0	3 39	10 10	9 58	19 6	10 24	19 1	5·5
S.	9	6 8	19 4	6 35	18 11	4 4	10 8	4 30	10 6	10 52	18 9	11 24	18 4	☽
S.	10	7 3	18 7	7 33	18 4	4 57	10 5	5 26	10 4			noon	18 0	7·5
M.	11	8 4	18 2	8 38	18 3	5 56	10 3	6 30	10 2	0 34	17 8	1 6	17 6	8·5
Tu.	12	9 15	18 3	9 51	18 4	7 7	10 2	7 45	10 3	1 38	17 5	2 10	17 7	9·5
W.	13	10 26	18 5	11 0	18 6	8 20	10 4	8 53	10 6	2 42	17 10	3 14	18 2	10·5
Th.	14	11 33	18 9	—	—	9 25	10 8	9 56	10 10	3 46	18 7	4 16	18 11	11·5
F.	15	0 4	19 1	0 33	19 5	10 25	11 0	10 51	11 1	4 43	19 2	5 7	19 5	12·5
S.	16	0 59	19 7	1 22	19 9	11 15	11 2	11 38	11 3	5 31	19 8	5 54	19 10	13·5
S.	17	1 45	19 10	2 8	19 11	—	—	noon	11 4	6 17	19 11	6 39	20 0	○
M.	18	2 29	20 0	2 49	20 1	0 21	11 4	0 42	11 3	7 0	20 0	7 21	20 1	15·5
Tu.	19	3 8	20 1	3 27	20 0	1 3	11 3	1 23	11 2	7 40	20 0	7 59	19 11	16·5
W.	20	3 45	19 11	4 3	19 10	1 41	11 1	1 59	11 0	8 17	19 9	8 35	19 7	17·5
Th.	21	4 21	19 9	4 39	19 7	2 17	10 11	2 36	10 10	8 53	19 4	9 11	19 1	18·5
F.	22	4 57	19 5	5 15	19 3	2 55	10 8	3 13	10 6	9 30	18 9	9 49	18 5	19·5
S.	23	5 34	18 11	5 53	18 7	3 31	10 5	3 49	10 4	10 8	18 1	10 27	17 9	20·5
S.	24	6 12	18 3	6 32	18 0	4 7	10 2	4 26	10 1	10 48	17 6	11 11	17 2	21·5
M.	25	6 53	17 8	7 15	17 5	4 46	9 11	5 8	9 10	11 37	16 10	—	—	☾
Tu.	26	7 40	17 3	8 8	17 1	5 32	9 9	5 59	9 8	0 7	16 6	0 37	16 3	23·5
W.	27	8 39	17 1	9 13	17 2	6 31	9 7	7 7	9 8	1 7	16 1	1 38	16 1	24·5
Th.	28	9 49	17 4	10 24	17 7	7 43	9 9	8 17	9 10	2 9	16 2	2 41	16 5	25·5
F.	29	10 58	17 7	11 30	17 10	8 51	10 0	9 23	10 2	3 13	16 11	3 44	17 5	26·5
S.	30	—	—	noon	18 4	9 53	10 5	10 21	10 8	4 14	17 11	4 41	18 6	27·5
S.	31	0 29	18 9	0 56	19 3	10 47	10 11	11 12	11 1	5 5	19 0	5 28	19 5	28·5

LONDON (London bridge). APPROXIMATE - { RISE 5 30 / FALL 7 0 } H.M.
HARWICH (Angel quay). APPROXIMATE - { RISE 6 25 / FALL 6 0 } H.M.
HULL (Victoria dock). APPROXIMATE - { RISE 6 40 / FALL 6 30 } H.M.

Half mean spring range: London 10ft. 4in. — Harwich 5ft. 9in. — Hull 10ft. 5in.

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	10	50	Add.	9	7	30	Add.	17	3	44	Add.	25	0	15	Sub.
2	10	27		10	7	3		18	3	14		26	0	45	
3	10	3		11	6	35		19	2	45		27	1	14	
4	9	39		12	6	8		20	2	15		28	1	44	
5	9	14		13	5	39		21	1	45		29	2	13	
6	8	49		14	5	11		22	1	15		30	2	42	
7	8	23		15	4	42		23	0	45		31	3	11	
8	7	57		16	4	13		24	0	15					

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for LONDON 0 m. HARWICH *subtract* 5 m. HULL *add* 1 m.

DECEMBER, 1899.

WEEK DAY	MONTH DAY	MOON'S TRANSIT H. M.	SUNDERLAND (North dock) APPROXIMATE { RISE 0 5 / FALL 6 25				NORTH SHIELDS (Low lighthouse) APPROXIMATE { RISE 5 40 / FALL 6 45				LEITH (East pier) APPROXIMATE { RISE 0 0 / FALL 6 15			
			MORNING		AFTERNOON		MORNING		AFTERNOON		MORNING		AFTERNOON	
		H. M.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.	Time H. M.	Height F. I.
F.	1	10 23	1 40	12 9	2 2	13 0	1 46	12 10	2 6	13 1	0 41	14 4	1 1	14 9
S.	2	11 18	2 24	13 3	2 45	13 6	2 26	13 4	2 46	13 8	1 22	15 1	1 43	15 5
S.	3	0 16	3 5	13 9	3 25	13 11	3 6	13 11	3 26	14 2	2 4	15 8	2 24	15 11
M.	4	1 15	3 46	14 1	4 7	14 3	3 46	14 4	4 7	14 5	2 44	16 1	3 4	16 1
Tu.	5	2 14	4 28	14 4	4 49	14 4	4 29	14 4	4 52	14 3	3 25	16 1	3 47	16 0
W.	6	3 10	5 12	14 2	5 36	14 0	5 16	14 2	5 40	14 1	4 10	15 11	4 34	15 10
Th.	7	4 4	6 0	13 9	6 25	13 6	6 4	13 11	6 28	13 9	4 58	15 8	5 23	15 5
F.	8	4 56	6 52	13 3	7 20	13 0	6 54	13 6	7 22	13 3	5 50	15 2	6 18	14 10
S.	9	5 46	7 48	12 9	8 17	12 6	7 51	13 0	8 22	12 8	6 46	14 6	7 16	14 2
S.	10	6 36	8 47	12 3	9 20	12 1	8 55	12 5	9 30	12 3	7 48	13 11	8 24	13 9
M.	11	7 25	9 55	11 11	10 30	11 10	10 6	12 2	10 42	12 2	9 0	13 7	9 35	13 6
Tu.	12	8 17	11 3	11 11	11 35	12 0	11 16	12 3	11 48	12 5	10 9	13 7	10 41	13 9
W.	13	9 9	—		0 6	12 3	—		0 20	12 7	11 13	13 11	11 44	14 1
Th.	14	10 3	0 37	12 6	1 7	12 9	0 50	12 9	1 17	12 11	—		0 12	14 4
F.	15	10 58	1 35	13 0	2 2	13 2	1 42	13 1	2 6	13 3	0 37	14 7	1 1	14 11
S.	16	11 53	2 27	13 4	2 50	13 5	2 29	13 6	2 51	13 8	1 25	15 2	1 48	15 4
S.	17	m.	3 11	13 6	3 31	13 8	3 12	13 10	3 32	13 11	2 10	15 6	2 30	15 7
M.	18	0 45	3 51	13 9	4 11	13 10	3 52	13 11	4 12	13 11	2 50	15 8	3 9	15 7
Tu.	19	1 35	4 31	13 9	4 50	13 8	4 32	13 10	4 52	13 8	3 28	15 6	3 47	15 4
W.	20	2 23	5 8	13 6	5 26	13 4	5 11	13 6	5 30	13 4	4 5	15 2	4 24	15 0
Th.	21	3 7	5 45	13 1	6 4	12 10	5 49	13 3	6 8	13 1	4 43	14 10	5 2	14 8
F.	22	3 50	6 23	12 8	6 43	12 5	6 27	12 11	6 46	12 9	5 21	14 6	5 41	14 3
S.	23	4 31	7 3	12 3	7 23	12 0	7 6	12 6	7 26	12 4	6 1	14 0	6 21	13 8
S.	24	5 12	7 44	11 9	8 5	11 6	7 47	12 0	8 10	11 8	6 42	13 5	7 5	13 2
M.	25	5 53	8 27	11 4	8 53	11 2	8 35	11 5	9 4	11 3	7 30	12 11	7 58	12 8
Tu.	26	6 36	9 23	11 0	9 55	10 10	9 35	11 2	10 7	11 0	8 28	12 6	9 1	12 5
W.	27	7 21	10 28	10 9	11 10	10 10	11 1	10 11	11 13	11 2	9 34	12 5	10 7	12 6
Th.	28	8 10	11 34	11 0	—		11 46	11 4	—		10 40	12 7	11 12	12 10
F.	29	9 3	0 5	11 3	0 35	11 7	0 18	11 7	0 48	11 10	11 42	13 2	—	
S.	30	9 59	1 4	12 0	1 31	12 5	1 16	12 2	1 41	12 6	0 10	13 6	0 35	13 11
S.	31	10 58	1 57	12 9	2 22	13 1	2 4	12 10	2 27	13 3	0 59	14 5	1 23	14 11
Half mean spring range.			7ft. 2in.				7ft. 4in.				8ft. 2in.			

Phases of the moon.

	D.	H.	M.	
New	3	0	48	Morning.
First Quarter	9	9	3	Afternoon.
Full	17	1	31	Morning.
Last Quarter	25	3	57	Morning.
In Perigee	7	6		Morning.
In Apogee	22	11		Afternoon.

Moon's declination at noon.

M.D.	o	'	M.D.	o	'	M.D.	o	'	M.D.	o	'
1	20 s.	19	9	2 s.	7	17	22 N.	31	25	7 s.	30
2	22	21	10	3 N.	24	18	20	46	26	11	51
3	23	7	11	8	42	19	18	4	27	15	49
4	22	27	12	13	30	20	14	38	28	19	10
5	20	22	13	17	32	21	10	38	29	21	38
6	17	0	14	20	36	22	6	17	30	22	58
7	12	38	15	22	29	23	1	43	31	22	54
8	7	34	16	23	7	24	2 s.	55			

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for SUNDERLAND add 6 m. | NORTH SHIELDS add 6 m. | LEITH add 13 m.

DECEMBER, 1899.

WEEK DAY	MONTH DAY	THURSO (near Scrabster pier). APPROXIMATE { RISE 6 30 / FALL 6 0 }				GREENOCK (East dock). APPROXIMATE { RISE 6 30 / FALL 6 0 }				LIVERPOOL (George pier). APPROXIMATE { RISE 6 35 / FALL 6 50 }				☽'s AGE AT NOON
		MORNING		AFTERNOON		MORNING		AFTERNOON		MORNING		AFTERNOON		
		Time H.M.	Height F.I.	Time H.M.	Height F.I.	Time H.M.	Height F.I.	Time H.M.	Height F.I.	Time H.M.	Height F.I.	Time H.M.	Height F.I.	D.
F.	1	6 58	11 7	7 16	12 0	10 23	9 0	10 45	9 2	9 41	24 7	10 1	24 9	28·1
S.	2	7 34	12 4	7 53	12 8	11 7	9 3	11 29	9 4	10 22	25 9	10 43	25 6	29·1
S.	3	8 12	12 11	8 32	13 0	11 51	9 5	—		11 4	26 5	11 26	26 0	●
M.	4	8 53	13 1	9 15	13 1	0 14	9 6	0 36	9 7	11 48	27 5	—		1·5
Tu.	5	9 37	13 0	10 0	12 11	0 58	9 8	1 21	9 8	0 10	26 4	0 32	27 6	2·5
W.	6	10 24	12 9	10 49	12 6	1 44	9 9	2 7	9 9	0 54	26 1	1 16	27 2	3·5
Th.	7	11 15	12 3	11 42	12 0	2 30	9 8	2 53	9 7	1 39	25 2	2 3	26 2	4·5
F.	8	—		0 10	11 8	3 16	9 6	3 41	9 5	2 27	24 5	2 52	25 6	5·5
S.	9	0 39	11 4	1 9	11 1	4 7	9 4	4 33	9 2	3 18	23 8	3 45	24 9	☽
S.	10	1 41	10 10	2 15	10 8	5 1	9 0	5 30	8 11	4 15	22 9	4 48	23 6	7·5
M.	11	2 52	10 6	3 30	10 5	6 2	8 9	6 36	8 8	5 24	22 4	6 2	23 5	8·5
Tu.	12	4 7	10 5	4 42	10 5	7 11	8 7	7 46	8 8	6 40	22 4	7 15	23 7	9·5
W.	13	5 15	10 6	5 46	10 9	8 21	8 9	8 55	8 10	7 49	22 11	8 21	23 10	10·5
Th.	14	6 13	11 1	6 36	11 5	9 27	8 11	9 55	9 0	8 50	23 10	9 16	24 7	11·5
F.	15	6 58	11 9	7 19	12 1	10 21	9 1	10 47	9 2	9 41	24 11	10 4	25 0	12·5
S.	16	7 39	12 4	7 59	12 6	11 12	9 3	11 36	9 3	10 27	25 8	10 49	25 4	13·5
S.	17	8 19	12 8	8 39	12 7	11 59	9 4	—		11 11	26 0	11 33	25 7	○
M.	18	8 58	12 6	9 17	12 5	0 21	9 4	0 42	9 5	11 54	26 4	—		15·5
Tu.	19	9 36	12 4	9 55	12 2	1 2	9 5	1 21	9 5	0 13	25 7	0 31	26 2	16·5
W.	20	10 14	12 0	10 33	11 9	1 39	9 4	1 57	9 4	0 49	25 2	1 7	25 7	17·5
Th.	21	10 53	11 6	11 13	11 3	2 15	9 4	2 33	9 3	1 25	24 6	1 43	25 0	18·5
F.	22	11 33	11 0	11 53	10 9	2 51	9 2	3 9	9 1	2 1	23 7	2 19	24 0	19·5
S.	23	—		0 13	10 6	3 27	9 0	3 45	8 11	2 37	22 9	2 55	23 4	20·5
S.	24	0 34	10 3	0 56	10 0	4 3	8 10	4 22	8 9	3 14	22 0	3 34	22 3	21·5
M.	25	1 20	9 10	1 47	9 8	4 43	8 7	5 7	8 5	3 57	21 4	4 23	21 6	☾
Tu.	26	2 18	9 6	2 53	9 4	5 34	8 4	6 3	8 2	4 52	20 7	5 25	21 0	23·5
W.	27	3 30	9 3	4 6	9 3	6 35	8 2	7 9	8 1	6 2	20 5	6 38	20 11	24·5
Th.	28	4 41	9 4	5 14	9 6	7 44	8 2	8 19	8 3	7 13	21 0	7 47	21 5	25·5
F.	29	5 44	9 10	6 12	10 3	8 52	8 5	9 23	8 7	8 19	22 2	8 48	22 5	26·5
S.	30	6 36	10 8	6 57	11 3	9 52	8 9	10 18	8 11	9 14	23 2	9 38	23 9	27·5
S.	31	7 17	11 9	7 37	12 4	10 43	9 1	11 8	9 3	10 1	25 4	10 24	24 11	28·5

Half mean spring range. : Thurso 6ft. 7in. — Greenock 4ft. 10in. — Liverpool 13ft. 9in.

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	10	50	Add.	9	7	30	Add.	17	3	44	Add.	25	0	15	Sub.
2	10	27		10	7	3		18	3	14		26	0	45	
3	10	3		11	6	35		19	2	45		27	1	14	
4	9	39		12	6	8		20	2	15		28	1	44	
5	9	14		13	5	39		21	1	45		29	2	13	
6	8	49		14	5	11		22	1	15		30	2	42	
7	8	23		15	4	42		23	0	45		31	3	11	
8	7	57		16	4	13		24	0	15					

The times of high water are given for Mean time at place ; if Greenwich or Railway time be required,—for THURSO add 14 m. | GREENOCK add 19 m. | LIVERPOOL add 12 m.

DECEMBER, 1899.

Week Day	Month Day	Moon's Transit H. M.	PEMBROKE (H.M. Dockyard). Approximate {Rise 6 10 / Fall 6 20} Morning Time H. M.	Height F. I.	Afternoon Time H. M.	Height F. I.	PORTISHEAD (Dock entr.). Approximate {Rise 5 40 / Fall 6 40} Morning Time H. M.	Height F. I.	Afternoon Time H. M.	Height F. I.	HOLYHEAD (Pier). Approximate {Rise 6 20 / Fall 6 0} Morning Time H. M.	Height F. I.	Afternoon Time H. M.	Height F. I.
F.	1	10m23	4 23	20 2	4 47	20 7	5 26	37 11	5 50	38 8	8 36	14 7	8 56	14 10
S.	2	11 18	5 11	21 0	5 34	21 5	6 13	39 6	6 35	40 2	9 16	15 2	9 36	15 5
S.	3	0a16	5 56	21 9	6 18	22 0	6 57	40 10	7 18	41 4	9 56	15 7	10 16	15 8
M.	4	1 15	6 40	22 2	7 1	22 4	7 39	41 6	8 0	41 7	10 36	15 0	10 56	15 10
Tu.	5	2 14	7 22	22 4	7 44	22 3	8 22	41 6	8 44	41 5	11 17	15 10	11 41	15 9
W.	6	3 10	8 7	22 1	8 30	21 10	9 6	41 9	9 28	41 0	—		0 6	15 9
Th.	7	4 4	8 53	21 6	9 17	21 2	9 50	40 6	10 12	39 10	0 31	15 5	0 57	15 2
F.	8	4 56	9 41	20 9	10 5	20 4	10 3	39 2	10 56	38 4	1 24	14 11	1 51	14 8
S.	9	5 46	10 29	19 10	10 54	19 4	11 18	37 3	11 42	36 3	2 19	14 5	2 49	14 1
S.	10	6 36	11 19	18 10	11 47	18 7	—		0 10	35 6	3 22	13 10	3 57	13 8
M.	11	7 25	—		0 19	18 5	0 43	34 9	1 8	34 6	4 33	13 6	5 9	13 6
Tu.	12	8 17	0 54	18 5	1 33	18 6	1 55	34 7	2 33	34 10	5 43	13 7	6 15	13 9
W.	13	9 9	2 12	18 9	2 49	19 1	3 12	35 5	3 51	36 2	6 47	13 11	7 18	14 1
Th.	14	10 3	3 23	19 7	3 53	20 0	4 27	37 0	4 58	37 9	7 47	14 3	8 12	14 6
F.	15	10 58	4 22	20 3	4 50	20 9	5 26	38 5	5 53	38 11	8 36	14 9	8 59	14 11
S.	16	11 53	5 16	21 0	5 40	21 2	6 18	39 4	6 41	39 9	9 21	15 1	9 43	15 3
S.	17	m.	6 2	21 4	6 24	21 5	7 3	40 1	7 24	40 2	10 3	15 3	10 22	15 4
M.	18	0 45	6 44	21 6	7 3	21 5	7 44	40 2	8 3	39 11	10 41	15 4	10 59	15 3
Tu.	19	1 35	7 22	21 6	7 40	21 1	8 22	39 8	8 40	39 4	11 17	15 2	11 36	15 1
W.	20	2 23	7 58	20 11	8 16	20 9	8 57	39 1	9 14	38 10	11 55	14 11	—	
Th.	21	3 7	8 34	20 6	8 52	20 2	9 31	38 6	9 48	38 1	0 15	14 9	0 35	14 7
F.	22	3 50	9 10	19 10	9 27	19 6	10 5	37 5	10 21	36 10	0 55	14 4	1 15	14 1
S.	23	4 31	9 44	19 1	10 1	18 8	10 37	36 3	10 53	35 6	1 35	13 10	1 55	13 5
S.	24	5 12	10 19	18 4	10 38	17 11	11 9	34 7	11 27	33 8	2 15	13 5	2 37	13 2
M.	25	5 53	10 58	17 6	11 21	17 1	11 48	32 10	—		3 0	12 11	3 28	12 8
Tu.	26	6 36	11 48	16 10	—		0 13	32 2	0 44	31 7	3 59	12 6	4 33	12 5
W.	27	7 21	0 18	16 9	0 52	16 9	1 17	31 5	1 52	31 6	5 8	12 5	5 41	12 6
Th.	28	8 10	1 29	16 11	2 6	17 3	2 29	31 10	3 6	32 7	6 14	12 9	6 46	13 0
F.	29	9 3	2 43	17 9	3 17	18 5	3 44	33 8	4 20	34 10	7 16	13 2	7 44	13 7
S.	30	9 59	3 48	19 1	4 17	19 9	4 52	36 1	5 21	37 3	8 10	14 0	8 34	14 5
S.	31	10 58	4 45	20 5	5 12	21 0	5 48	38 4	6 14	39 6	8 57	14 9	9 20	15 2

Half mean spring range.	11 ft. 3 in.	21 ft. 0 in.	8 ft. 0 in.

Phases of the moon.

	D.	H.	M.	
New	3	0	48	Morning
First Quarter	9	9	3	Afternoon
Full	17	1	31	Morning
Last Quarter	25	3	57	Morning
In Perigee	7		6	Morning
In Apogee	22		11	Afternoon

Moon's declination at noon.

M.D.	° '	M.D.	° '	M.D.	° '	M.D.	° '
1	20 S. 19	9	2 S. 7	17	22 N.31	25	7 S. 30
2	22 11	10	3 N.24	18	20 46	26	11 51
3	23 7	11	8 42	19	18 4	27	15 49
4	22 27	12	13 30	20	14 38	28	19 10
5	20 22	13	17 32	21	10 38	29	21 38
6	17 0	14	20 36	22	6 17	30	22 58
7	12 38	15	22 29	23	1 43	31	22 54
8	7 34	16	23 7	24	2 S.55		

The times of high water are given for Mean time at place; if Greenwich or Railway time be required,—for
PEMBROKE *add* 20 m. | PORTISHEAD *add* 11 m. | HOLYHEAD *add* 18 m.

DECEMBER, 1899.

WEEK DAY.	MONTH DAY.	KINGSTOWN (Watering pier). APPROXIMATE {RISE 6 15 / FALL 6 0}				BELFAST (New dock). APPROXIMATE {RISE 6 20 / FALL 6 0}				LONDONDERRY (Ship bridge). APPROXIMATE {RISE 6 15 / FALL 6 15}				D's AGE AT NOON.
		MORNING		AFTERNOON		MORNING		AFTERNOON		MORNING		AFTERNOON		
		Time H. M.	Height F. L.	Time H. M.	Height F. L.	Time H. M.	Height F. L.	Time H. M.	Height F. L.	Time H. M.	Height F. L.	Time H. M.	Height F. L.	D.
F.	1	9 35	10 1	9 56	10 3	9 12	8 11	9 32	9 1	6 21	7 0	6 42	7 2	28·1
S.	2	10 15	10 5	10 34	10 7	9 52	9 2	10 12	9 3	7 4	7 3	7 26	7 4	29·1
S.	3	10 54	10 9	11 14	10 10	10 32	9 4	10 52	9 4	7 47	7 6	8 7	7 7	●
M.	4	11 36	10 10	11 58	10 10	11 13	9 4	11 34	9 5	8 27	7 8	8 47	7 7	1·5
Tu.	5	—		0 21	10 9	11 56	9 5	—		9 7	7 6	9 28	7 5	2·5
W.	6	0 45	10 9	1 9	10 8	0 20	9 5	0 45	9 4	9 50	7 4	10 12	7 3	3·5
Th.	7	1 33	10 6	1 58	10 4	1 10	9 3	1 36	9 2	10 36	7 1	11 3	6 11	4·5
F.	8	2 24	10 3	2 51	10 1	2 4	9 1	2 34	9 0	11 35	6 8	—		5·5
S.	9	3 18	9 11	3 48	9 11	3 3	8 10	3 32	8 9	0 10	6 5	0 47	6 3	D
S.	10	4 20	9 7	4 53	9 6	4 3	8 8	4 35	8 7	1 26	6 3	2 5	6 2	7·5
M.	11	5 26	9 5	5 59	9 5	5 7	8 5	5 40	8 5	2 44	6 3	3 18	6 4	8·5
Tu.	12	6 31	9 6	7 3	9 7	6 13	8 4	6 47	8 4	3 48	6 6	4 16	6 8	9·5
W.	13	7 35	9 8	8 7	9 10	7 20	8 5	7 52	8 6	4 43	6 9	5 8	6 10	10·5
Th.	14	8 38	9 11	9 8	10 1	8 21	8 8	8 46	8 10	5 32	6 11	5 56	7 0	11·5
F.	15	9 35	10 2	9 59	10 4	9 11	9 0	9 35	9 1	6 20	7 1	6 44	7 2	12·5
S.	16	10 20	10 5	10 40	10 6	9 57	9 2	10 19	9 2	7 8	7 3	7 31	7 3	13·5
S.	17	11 0	10 7	11 20	10 7	10 39	9 3	10 59	9 3	7 53	7 4	8 13	7 4	O
M.	18	11 40	10 6	mid	10 6	11 18	9 2	11 37	9 2	8 32	7 4	8 50	7 3	15·5
Tu.	19	—		0 20	10 5	11 56	9 1	—		9 7	7 2	9 24	7 1	16·5
W.	20	0 39	10 4	0 58	10 3	0 15	9 1	0 34	9 0	9 40	6 11	9 57	6 10	17·5
Th.	21	1 17	10 2	1 36	10 0	0 54	9 0	1 14	8 11	10 15	6 8	10 34	6 7	18·5
F.	22	1 55	9 10	2 15	9 9	1 34	8 10	1 55	8 9	10 54	6 5	11 17	6 5	19·5
S.	23	2 35	9 7	2 55	9 6	2 16	8 8	2 37	8 7	11 41	6 1	—		20·5
S.	24	3 15	9 4	3 36	9 3	2 58	8 6	3 19	8 4	0 6	5 11	0 34	5 9	21·5
M.	25	3 59	9 1	4 26	8 11	3 42	8 3	4 8	8 2	1 4	5 8	1 36	5 7	☽
Tu.	26	4 56	8 10	5 27	8 9	4 37	8 1	5 8	8 0	2 10	5 6	2 44	5 7	23·5
W.	27	5 58	8 9	6 29	8 10	5 39	8 0	6 11	8 0	3 17	5 8	3 47	5 10	24·5
Th.	28	7 1	8 11	7 33	9 1	6 44	8 0	7 17	8 1	4 16	6 0	4 44	6 2	25·5
F.	29	8 4	9 3	8 34	9 6	7 48	8 2	8 17	8 4	5 9	6 4	5 32	6 6	26·5
S.	30	9 3	9 9	9 30	9 11	8 44	8 7	9 8	8 10	5 55	6 8	6 18	6 10	27·5
S.	31	9 55	10 2	10 18	10 5	9 32	9 0	9 55	9 2	6 42	7 1	7 6	7 3	28·5

Half mean spring range: Kingstown 5ft. 6m.   Belfast 4ft. 9in.   Londonderry 3ft. 10in.

Equation of time at noon.

M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.		M.D.	M.	S.	
1	10	50	Add.	9	7	30	Add.	17	3	44	Add.	25	0	15	Sub.
2	10	27		10	7	3		18	3	14		26	0	45	
3	10	3		11	6	35		19	2	45		27	1	14	
4	9	39		12	6	8		20	2	15		28	1	44	
5	9	14		13	5	39		21	1	45		29	2	13	
6	8	49		14	5	11		22	1	15		30	2	42	
7	8	23		15	4	42		23	0	45		31	3	11	
8	7	57		16	4	13		24	0	15					

The times of high water are given for Mean time at place ; if Dublin or Railway time be required,—for KINGSTOWN *subtract* 1 m. for Dublin time. | BELFAST *subtract* 2 m. | LONDONDERRY *add* 4 m.

DECEMBER, 1899.

Week Day	Month Day	Moon's Transit H.M.	SLIGO BAY (Mullaghmore) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	GALWAY (Nimmo pier) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.	QUEENSTOWN (Scott's wharf) Morning Time H.M.	Height F.I.	Afternoon Time H.M.	Height F.I.
			Approximate { RISE 6 10 / FALL 6 20 }				Approximate { RISE 6 30 / FALL 6 0 }				Approximate { RISE 6 5 / FALL 6 25 }			
F.	1	10m 23	3 39	10 0	3 58	10 3	2 57	13 0	3 18	13 0	3 16	10 6	3 39	10 9
S.	2	11 18	4 18	10 6	4 40	10 8	3 39	13 8	3 59	13 11	4 1	11 0	4 22	11 3
S.	3	0a 16	5 1	10 11	5 23	11 0	4 20	14 3	4 41	14 5	4 44	11 5	5 6	11 6
M.	4	1 15	5 44	11 1	6 5	11 1	5 3	14 7	5 25	14 8	5 28	11 7	5 50	11 8
Tu.	5	2 14	6 26	11 0	6 49	10 11	5 47	14 8	6 10	14 7	6 12	11 9	6 36	11 8
W.	6	3 10	7 12	10 6	7 35	10 6	6 34	14 5	6 58	14 3	7 0	11 7	7 23	11 5
Th.	7	4 4	7 59	10 3	8 25	10 0	7 23	14 0	7 49	13 9	7 46	11 3	8 9	11 1
F.	8	4 56	8 53	9 9	9 23	9 7	8 16	13 4	8 43	12 11	8 32	10 10	8 55	10 8
S.	9	5 46	9 55	9 5	10 29	9 3	9 11	12 6	9 41	12 3	9 20	10 5	9 46	10 2
S.	10	6 36	11 5	9 2	11 40	9 1	10 14	12 1	10 48	12 0	10 15	10 0	10 47	9 11
M.	11	7 25	—	—	0 14	9 1	11 24	11 11	11 59	12 0	11 22	9 10	11 57	9 10
Tu.	12	8 17	0 47	9 1	1 20	9 2	—	—	0 32	12 1	—	—	0 32	9 11
W.	13	9 9	1 53	9 3	2 24	9 5	1 5	12 3	1 36	12 6	1 8	10 0	1 44	10 1
Th.	14	10 3	2 52	9 8	3 16	9 11	2 4	12 9	2 31	13 0	2 17	10 3	2 47	10 5
F.	15	10 58	3 39	10 1	4 1	10 3	2 57	13 3	3 21	13 5	3 15	10 8	3 41	10 10
S.	16	11 53	4 23	10 5	4 45	10 7	3 44	13 7	4 6	13 9	4 6	11 0	4 29	11 1
S.	17	m.	5 7	10 8	5 28	10 9	4 26	13 11	4 46	14 0	4 51	11 2	5 13	11 3
M.	18	0 45	5 48	10 9	6 7	10 8	5 6	14 1	5 26	14 0	5 34	11 3	5 54	11 2
Tu.	19	1 35	6 26	10 6	6 45	10 4	5 46	13 11	6 5	13 9	6 14	11 2	6 32	11 1
W.	20	2 23	7 4	10 2	7 22	10 0	6 24	13 7	6 43	13 5	6 50	11 0	7 8	10 11
Th.	21	3 7	7 40	9 9	7 58	9 7	7 2	13 3	7 21	13 0	7 26	10 9	7 44	10 7
F.	22	3 50	8 17	9 4	8 37	9 2	7 41	12 9	8 1	12 6	8 2	10 5	8 19	10 3
S.	23	4 31	8 57	9 0	9 19	8 10	8 21	12 1	8 41	11 11	8 35	10 0	8 52	9 10
S.	24	5 12	9 43	8 8	10 10	8 6	9 1	11 5	9 23	11 2	9 10	9 8	9 30	9 6
M.	25	5 53	10 39	8 4	11 9	8 3	9 48	10 11	10 17	10 9	9 52	9 4	10 18	9 2
Tu.	26	6 36	11 40	8 2	—	—	10 49	10 8	11 23	10 8	10 48	9 0	11 20	9 0
W.	27	7 21	0 12	8 2	0 45	8 3	11 57	10 9	—	—	11 54	8 11	—	—
Th.	28	8 10	1 19	8 4	1 52	8 6	0 33	10 11	1 4	11 2	0 29	9 1	1 5	9 3
F.	29	9 3	2 22	8 9	2 50	9 1	1 34	11 6	2 1	11 10	1 40	9 5	2 13	9 8
S.	30	9 59	3 15	9 5	3 37	9 9	2 27	12 4	2 52	12 9	2 43	10 0	3 11	10 4
S.	31	10 58	3 59	10 1	4 21	10 6	3 17	13 3	3 41	13 8	3 37	10 8	4 2	11 0
Half mean spring range			5ft. 7in.				7ft. 5in.				5ft. 10in.			

Phases of the moon.

	D.	H.	M.	
New	3	0	48	Morning.
First Quarter	9	9	3	Afternoon.
Full	17	1	31	Morning.
Last Quarter	25	3	57	Morning.
In Perigee		7	6	Morning.
In Apogee		22	11	Afternoon.

Moon's declination at noon.

M.D.	o	'	M.D.	o	'	M.D.	o	'	M.D.	o	'
1	20 S.	19	9	2 S.	7	17	22 N.	31	25	7 S.	30
2	22	11	10	3 N.	24	18	20	46	26	11	51
3	23	7	11	8	42	19	18	4	27	15	49
4	22	27	12	13	30	20	14	38	28	19	10
5	20	22	13	17	32	21	10	38	29	21	38
6	17	0	14	20	36	22	6	17	30	22	58
7	12	38	15	22	29	23	1	43	31	22	54
8	7	34	16	23	7	24	2 S.	55			

The times of high water are given for Mean time at place ; if Dublin or Railway time be required,—for SLIGO BAY *add* 9 m. | GALWAY *add* 11 m. | QUEENSTOWN *add* 8 m.

DECEMBER, 1899.

WATERFORD (*Duncannon fort*).

APPROXIMATE — RISE 6 5 / FALL 6 20 (H. M.)

Week Day	Month Day	Morning Time H. M.	Morning Height F. I.	Afternoon Time H. M.	Afternoon Height F. I.	Morning Time / Height	Afternoon Time / Height	Morning Time / Height	Afternoon Time / Height	☾'s AGE AT NOON. D.
F.	1	3 33	11 4	3 58	11 6					28·1
S.	2	4 22	11 9	4 45	11 11					29·1
S.	3	5 7	12 0	5 29	12 2					●
M.	4	5 50	12 3	6 12	12 4					1·5
Tu.	5	6 35	12 4	6 58	12 5					2·5
W.	6	7 21	12 5	7 43	12 4					3·5
Th.	7	8 5	12 2	8 27	12 0					4·5
F.	8	8 49	11 10	9 12	11 8					5·5
S.	9	9 36	11 5	10 4	11 2					☽
S.	10	10 35	10 11	11 7	10 9					7·5
M.	11	11 40	10 7	—	—					8·5
Tu.	12	0 12	10 6	0 44	10 7					9·5
W.	13	1 18	10 8	1 54	10 10					10·5
Th.	14	2 30	11 1	3 2	11 3					11·5
F.	15	3 32	11 5	4 0	11 7					12·5
S.	16	4 27	11 8	4 52	11 9					13·5
S.	17	5 14	11 9	5 34	11 10					○
M.	18	5 54	11 11	6 14	11 11					15·5
Tu.	19	6 34	11 10	6 53	11 10					16·5
W.	20	7 11	11 9	7 29	11 8					17·5
Th.	21	7 47	11 7	8 4	11 6					18·5
F.	22	8 21	11 5	8 17	11 3					19·5
S.	23	8 53	11 1	9 8	10 11					20·5
S.	24	9 26	10 8	9 47	10 6					21·5
M.	25	10 12	10 3	10 40	10 0					☾
Tu.	26	11 9	9 9	11 39	9 9					23·5
W.	27	—	—	0 10	9 8					24·5
Th.	28	0 42	9 10	1 15	10 0					25·5
F.	29	1 49	10 3	2 23	10 6					26·5
S.	30	2 56	10 9	3 26	11 1					27·5
S.	31	3 54	11 5	4 22	11 9					28·5

Half mean spring range } 6ft. 2in.

Equation of time at noon.

M.D.	M. S.		M.D.	M. S.		M.D.	M. S.		M.D.	M. S.	
1	10 50	Add.	9	7 30	Add.	17	3 44	Add.	25	0 15	Sub.
2	10 27		10	7 3		18	3 14		26	0 45	
3	10 3		11	6 35		19	2 45		27	1 14	
4	9 39		12	6 8		20	2 15		28	1 44	
5	9 14		13	5 39		21	1 45		29	2 13	
6	8 49		14	5 11		22	1 15		30	2 42	
7	8 23		15	4 42		23	0 45		31	3 11	
8	7 57		16	4 13		24	0 15				

The times of high water are given for Mean time at place ; if Dublin or Railway time be required,—for WATERFORD *add* 3 m.

TABLE (B) —*For finding the height of the tide at any intermediate hour between High and Low water.*

Height above half tide or mean level of the sea.	Time from High water.												
	H.M. 0 00	H.M. 0 30	H.M. 1 0	H.M. 1 30	H.M. 2 0	H.M. 2 30	H.M. 3 0	H.M. 3 30	H.M. 4 0	H.M. 4 30	H.M. 5 0	H.M. 5 30	H.M. 6 0
	Add.							Subtract.					
Feet	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.
3	3 0	2 11	2 7	2 1	1 6	0 9	0 0	0 9	1 6	2 1	2 7	2 11	3 0
4	4 0	3 10	3 6	2 10	2 0	1 0	0 0	1 0	2 0	2 10	3 6	3 10	4 0
5	5 0	4 10	4 4	3 6	2 6	1 3	0 0	1 3	2 6	3 6	4 4	4 10	5 0
6	6 0	5 10	5 2	4 3	3 0	1 7	0 0	1 7	3 0	4 3	5 2	5 10	6 0
7	7 0	6 9	6 1	4 11	3 6	1 10	0 0	1 10	3 6	4 11	6 1	6 9	7 0
8	8 0	7 9	6 11	5 8	4 0	2 1	0 0	2 1	4 0	5 8	6 11	7 9	8 0
9	9 0	8 8	7 9	6 4	4 6	2 4	0 0	2 4	4 6	6 4	7 9	8 8	9 0
10	10 0	9 8	8 8	7 1	5 0	2 7	0 0	2 7	5 0	7 1	8 8	9 8	10 0
11	11 0	10 8	9 6	7 9	5 6	2 10	0 0	2 10	5 6	7 9	9 6	10 8	11 0
12	12 0	11 7	10 5	8 6	6 0	3 1	0 0	3 1	6 0	8 6	10 5	11 7	12 0
13	13 0	12 7	11 3	9 2	6 6	3 4	0 0	3 4	6 6	9 2	11 3	12 7	13 0
14	14 0	13 6	12 1	9 11	7 0	3 7	0 0	3 7	7 0	9 11	12 1	13 6	14 0
15	15 0	14 6	13 0	10 7	7 6	3 11	0 0	3 11	7 6	10 7	13 0	14 6	15 0
16	16 0	15 5	13 10	11 4	8 0	4 2	0 0	4 2	8 0	11 4	13 10	15 5	16 0
17	17 0	16 5	14 9	12 0	8 6	4 5	0 0	4 5	8 6	12 0	14 9	16 5	17 0
18	18 0	17 5	15 7	12 9	9 0	4 8	0 0	4 8	9 0	12 9	15 7	17 5	18 0
19	19 0	18 4	16 5	13 5	9 6	4 11	0 0	4 11	9 6	13 5	16 5	18 4	19 0
20	20 0	19 4	17 4	14 2	10 0	5 2	0 0	5 2	10 0	14 2	17 4	19 4	20 0
21	21 0	20 3	18 2	14 10	10 6	5 5	0 0	5 5	10 6	14 10	18 2	20 3	21 0
22	22 0	21 3	19 1	15 7	11 0	5 8	0 0	5 8	11 0	15 7	19 1	21 3	22 0
23	23 0	22 3	19 11	16 3	11 6	5 11	0 0	5 11	11 6	16 3	19 11	22 3	23 0
24	24 0	23 2	20 9	17 0	12 0	6 2	0 0	6 2	12 0	17 0	20 9	23 2	24 0

RULE.—To find the height of the tide above the zero of the tables at any intermediate hour between *High and Low water.**

The zero of the tables is the mean height of the low water of ordinary spring tides.

From the height in the tables, subtract the half mean spring range, the remainder will be the height above the half tide or mean level of the sea, with which enter table (B), and, under the time from high water, take out the corresponding correction, and, as directed, add it to, or subtract it from, the half mean spring range ; the result will be the height of the tide at that time above zero or the low water standard of the tables.

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* The mean interval of time between two consecutive high waters is about 12h. 25m., but for the mariner's purpose the duration of flood or ebb may be considered as 6 hours. There are occasional exceptions ; at Portsmouth, for example, the flood runs 7¾ hours and the ebb 5¼ hours.

EXAMPLE I.

Required the height of the tide above zero at Liverpool February 28th, 1894, A.M., at 2 h. after high water.

	Ft. in.
Height of high water (by the tables) · · · · ·	19 10
Half mean spring range · · · · · ·	13 9
Height above the half tide or mean level of the sea ·	− 6 1
Half mean spring range · · · · · ·	13 9
By table (B) 6 ft. 1 in. gives · · · · ·	+ 3 0
Height of the tide above zero at 2 h. after high water	−16 9

EXAMPLE II.

Required the height of the tide above zero at Liverpool on April 11th, 1894, P.M., at 4 h. after high water.

	Ft. in.
Height of high water (by the tables) · · · ·	23 9
Half mean spring range · · · · ·	13 9
Height above the half tide or mean level of the sea ·	10 0
Half mean spring range · · · · ·	13 9
By table (B) 10 ft. 0 in. gives · · · · ·	− 5 0
Height of the tide above zero at 4 h. after high water	= 8 9

In some cases, however, between 5 and 6 h. from high water, the correction from table (B) will be greater than the half mean spring range ; when such is the case, the tide at that time will have fallen *below* the zero of the tables by a quantity equal to the difference between the correction from table (B) and the half mean spring range.

EXAMPLE III.

Required the level of the tide at Liverpool on September 29th, 1894, P.M., at $5\frac{1}{2}$ h. after high water.

	Ft. in.
Height of high water (by the tables) · · · ·	29 2
Half mean spring range · · · · ·	13 9
Height above the half tide or mean level of the sea ·	15 5
Half mean spring range · · · · ·	13 9
By table (B) 15 ft. 5 in. at $5\frac{1}{2}$ h. from high water ·	− 14 11
Level of the tide *below* zero · · · · ·	− 1 2

The same rule is applicable for any of the ports the *constants* for which are given at pages 101–105.

Example. Required the height of the tide above zero at Beaumaris on February 28th, 1894, A.M., at 2 h. after high water. Liverpool is the standard port for reference, and 4 ft. 0 in. the constant to

be applied to the height at Liverpool to find the height at Beaumaris (*see* page 102).

	Ft. in.
Height of high water at Liverpool (by the tables)	19 10
Constant for Beaumaris	4 0
Height of water at Beaumaris	15 10
Half mean spring range at Beaumaris (*see* page 171	11 7
Height above the half tide or mean level of the sea	4 3
Half mean spring range	11 7
By table (B) 4 ft. 3 in. gives	+ 2 2
Height of the tide above zero at 2 h. after high water	= 13 9

As stated in the preface, the soundings in most charts are reduced to the same zero as these tables—viz., the mean level of the low water of ordinary spring tides—but should the soundings on any particular chart be reduced to a standard below that zero, there will, in that case, be a greater depth of water in the channel than is given in the tables, by a quantity equal to the difference between the half mean spring range and the half spring range of the chart, or, in other words, the difference between the mean level of the low water of spring tides, and the low water standard to which the soundings on the chart are reduced; for example— The soundings on the chart of Liverpool are reduced to a zero 15 ft. below the mean level of the sea, whereas, the mean spring range for that place, by the self-registering Tide gauge at George pier, is $27\frac{1}{2}$ ft., giving $13\frac{3}{4}$ ft. below the mean level of the sea;[*] consequently $1\frac{1}{4}$ ft. will have to be added to the results deduced from table (B).

Thus, in Example I. On the chart of Liverpool, 11 ft. being marked on the bar of Queen's channel, the actual depth over the bar at 2 h. after high water would be 16 ft. 9 in. + 11 ft. 0 in. + 1 ft. 3 in. = 29 ft. 0 in.

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[*] The datum mark at Liverpool is the level of the Old dock sill. This datum mark is 5 ft. below half tide or mean level of the sea, and consequently $3\frac{3}{4}$ ft. above the zero of these Tables.

The datum of the Ordnance Survey of Great Britain is 4·67 ft. above the level of the Old dock sill.

TIDAL CONSTANTS

FOR

VARIOUS BRITISH, IRISH, AND EUROPEAN PORTS.

THE following table contains Tidal constants for several places on the coasts of the United Kingdom and of Europe, which, being applied according to the sign + or — to the times or heights belonging to the standard port to which each of them is referred, will afford a ready means of determining *approximately* the height as well as the time of high water at each of those several places.

COAST OF IRELAND.	Constants.				Standard port for reference.
	Time.		Height.		
	H. M.		FT. IN.		
Skull .	— 0	59	— 2	1	Queenstown.
Crookhaven	— 0	52	— 1	6	,,
Dunmanus harbour	— 1	4	— 2	4	,,
Dunbeacon, Dunmanus bay	— 1	10	— 1	7	,,
Black Ball harbour	— 1	21	— 2	3	,,
Castletown, Bearhaven	— 0	47	— 2	0	,,
Bantry harbour .	— 1	14	— 1	7	,,
West cove, Kenmare river .	— 1	9	— 1	9	,,
Valentia harbour	— 1	19	— 0	8	,,
Fenit, Tralee bay	— 0	30	— 2	3	Galway.
Limerick, Shannon river	+ 1	35	+ 3	2	,,
Mellon ,,	+ 1	26	+ 3	0	,,
Foynes island ,,	+ 1	0	+ 0	7	,,
Tarbert ,,	+ 0	22	— 0	7	,,
Kilrush ,,	+ 0	7	— 0	8	,,
Carrigaholt ,,	+ 0	9	— 0	8	,,
Kilbaha ,,	— 0	19	— 1	9	,,
Roundstone	— 0	50	+ 1	9	Sligo.
Inishbofin .	— 0	44	+ 1	0	,,
Westport .	— 0	21	+ 1	1	,,
Achillbeg .	— 0	4	— 0	6	,,
Blacksod bay (quay) .	— 0	31	— 0	8	,,
Broadhaven harbour .	— 0	18	— 0	9	,,
Donegal harbour (Salthill quay) .	0	0	0	0	,,
Killybegs .	— 0	2	0	0	,,
Lough Rossmore	+ 0	2	— 0	4	,,
Gweedore bay (Bunbeg) .	+ 0	14	— 0	6	,,
Sheephaven	+ 0	14	+ 0	6	,,
Rathmullan, lough Swilly .	+ 0	24	+ 0	9	,,
Coleraine .	— 1	37	— 1	6	Londonderry.
Port Rush .	— 1	53	— 2	6	,,
Ballycastle bay .	— + 18		— 6	3	Belfast.
Lough Larne .	+ 0	5	— 2	3	,,
Donaghadee .	+ 0	1	+ 0	3	Kingstown.
Lough Strangford (Killard point) .	— 0	19	+ 2	9	,,
,, Strangford (quay) .	+ 1	19	— 0	6	,,
,, Carlingford (bar) or Cranfield point .	— 0	12	+ 3	6	,,
Warren point	— 0	2	+ 3	3	,,
Howth .	— 0	3	+ 1	6	,,
Dublin bar .	0	0	+ 1	6	,,

COAST OF IRELAND.	Constants.				Standard port for reference.
	Time.		Height.		
	H.	M.	FT.	IN.	
Wicklow	— 0	43	— 2	3	Kingstown.
Arklow . . .	— 3	12			,,
Wexford	+ 2	1	— 7	4	Waterford.
New Ross . . .	+ 0	44	0	0	,,
Waterford bridge .	+ 0	46	+ 1	0	,,
Dunmore	+ 0	7	— 0	2	,,
Ballinacourty, Dungarvan .	— 0	8	0	0	,,
Youghal . . .	— 0	6	+ 0	3	,,
Ballycotton . .	— 0	26	— 0	5	,,
Kinsale	— 0	18	— 0	4	Queenstown.
Courtmacsherry . .	— 0	25	— 1	0	,,
Castletownsend .	— 0	40	— 1	0	,,
Baltimore . . .	— 0	38	— 1	0	,,

PORTS OF GREAT BRITAIN.

	Time.		Height.		Standard port for reference.
	H.	M.	FT.	IN.	
St Ives	— 2	27			Portishead.
Padstow . . .	— 1	58			,,
Lundy island . .	— 1	56			,,
Barnstaple bridge .	— 0	43			,,
Ilfracombe . .	— 1	29			,,
Bridgewater bar .	— 0	21	— 7	0	,,
Weston-super-mare .	— 0	17	— 5	0	,,
Bristol . . .	+ 0	2	—10	6	,,
Cardiff . . .	— 0	11	— 5	6	,,
Swansea (Mumbles light-house) . . .	— 0	12	+ 4	0	Pembroke.
Llanelly . . .	+ 0	4	+ 1	10	,,
Tenby . . .	— 0	34	+ 2	6	,,
Milford haven (entrance) .	— 0	6	— 0	8	,,
Fishguard, Goodic pier .	— 3	15	— 3	6	Holyhead.
Cardigan . . .	— 3	10	— 3	9	,,
Aberystwyth . .	— 2	34	— 2	0	,,
Aberdovey . . .	— 2	14	0	0	,,
Barmouth . . .	— 2	25	— 2	0	,,
Pwllheli . . .	— 2	20	— 2	0	,,
Bardsey island . .	— 2	31	— 1	0	,,
Porth-Dinlleyn . .	— 1	31	— 3	3	,,
Carnarvon . . .	— 0	41	— 0	6	,,
Beaumaris . . .	— 0	53	— 4	0	Liverpool.
Port Fleetwood (Wyre light-house) . .	— 0	12	0	0	,,
Poulton-le-Sands .	+ 0	3	+ 1	0	,,
Piel harbour (Port of Barrow)	— 0	18	0	0	,,
Tarn point . . .	— 0	1	— 3	4	,,
Whitehaven . .	— 0	9	— 1	3	,,
St Bees head and port Harrington . . .	— 0	8	— 2	0	,,
Workington . .	— 0	19	— 1	6	,,
Maryport . . .	— 0	3	— 2	0	,,
Abbey head . .	— 0	13	— 2	0	,,
Southerness . .	+ 0	27	0	0	,,

Ports of Great Britain.	Constants.				Standard port for reference.
	Time.		Height.		
	H. M.		FT. IN.		
Annan Foot . . .	+ 0 42		+ 0	6	Liverpool.
Port Carlisle . .	+ 0 47				,,
Douglas, isle of Man . .	+ 1 1		+ 4	3	Holyhead.
Ramsey ,, . .	+ 1 1		+ 4	3	,,
Peel .. .	+ 0 57		+ 0	3	,,
Port Patrick . . .	− 0 58		+ 4	4	Greenock.
Loch Ryan . .	− 0 56		+ 0	6	,,
Lamlash . . .	− 0 19		− 0	6	,,
Campbelton . . .	− 0 23		− 1	10	,,
Ayr	− 0 18		− 1	0	,,
Ardrossan . . .	− 0 23		− 1	0	,,
Largs	− 0 18		0	0	,,
Inveraray . . .	− 0 8		0	0	,,
Glasgow . . .	+ 1 0		+ 1	3	,,
Crinan . . .	+ 4 41		− 4	4	,,
Oban	+ 5 20		+ 2	0	,,
Tobermory, isle of Mull .	− 2 52		0	0	Thurso.
Portree, isle of Skye .	− 1 56		+ 1	6	,,
Loch Inver . .	− 1 48		+ 1	0	,,
Kyle Akin . . .	− 2 12		+ 1	9	,,
Tanera, Summer isles .	− 1 51		+ 0	6	,,
Stornoway, isle of Lewis .	− 1 42		0	0	,,
Cape Wrath . .	− 0 58		+ 2	3	,,
Stromness . . .	+ 0 32		− 2	6	,,
Lerwick . . .	+ 2 2				,,
Wick . . .	− 2 55				Leith.
Dornoch road . .	− 2 17				,,
Cromarty . . .	− 2 21		− 2	0	,,
Inverness . . .	− 1 59				,,
Banff . . .	− 1 49				,,
Peterhead . . .	− 1 43				,,
Aberdeen . . .	− 1 17		− 3	4	,,
Stonehaven . . .	− 1 7		− 2	0	,,
Montrose . . .	0 0		− 3	0	,,
Arbroath . . .	− 0 42		− 2	0	,,
Tay bar . . .	− 0 11		0	0	,,
Broughty ferry . .	+ 0 5		− 2	0	,,
Dundee . . .	− 0 50		+ 0	2	Sunderland.
Dunbar . . .	− 1 14		0	0	,,
Berwick . . .	− 1 4		+ 0	6	,,
Holy island . . .	− 0 52		+ 0	6	,,
Blyth . . .	− 0 7		+ 0	3	,,
Tynemouth bar . .	− 0 2		+ 0	3	,,
Seaham . . .	+ 0 2		0	0	,,
Hartlepool . .	+ 0 6		+ 0	8	,,
Middlesborough . .	+ 0 30		+ 2	0	,,
Whitby . . .	+ 0 23		+ 0	6	,,
Scarborough . .	+ 0 49		+ 1	5	,,
Filey bay . .	+ 0 54		+ 1	6	,,
Flamborough head .	− 1 59		− 4	6	Hull.
Bridlington . .	− 1 50		− 4	6	,,
Spurn point .	− 1 3		− 1	8	,,

| Ports of Great Britain. | Constants. | | Standard port for reference. |
	Time.	Height.	
	H. M.	FT. IN.	
Great Grimsby	− 0 53	− 1 3	Hull.
Boston dock	0 0	0 0	,,
Lynn deep	− 0 29	+ 1 0	,,
Wells bar	− 0 9	− 2 9	,,
,, harbour	+ 0 31		,,
Blakeney bar	+ 0 1		,,
Yarmouth road	− 2 51	− 5 4	Harwich.
Lowestoft	− 2 9	− 4 9	,,
Orfordness	− 0 51	− 3 4	,,
Nore	− 0 7	− 0 4	Sheerness.
Gravesend	− 0 53	− 2 3	London.
Woolwich	− 0 21	− 2 0	,,
Greenwich	− 0 15	− 2 0	,,
London docks	− 0 5	0 0	,,
Margate	− 2 13	− 4 9	,,
Ramsgate	− 2 14	− 5 7	,,
Deal	+ 0 3	− 2 8	Dover.
Folkestone	− 0 5	+ 1 4	,,
Dungeness	− 0 27	+ 3 6	,,
Rye bay	+ 0 8	+ 2 9	,,
Hastings	− 0 19	+ 3 9	,,
Beachy head	+ 0 8	+ 0 8	,,
Newhaven	+ 0 39	+ 0 8	,,
Shoreham	+ 0 22	− 1 2	,,
Littlehampton	− 0 21	+ 1 6	Portsmouth.
Selsea bill	+ 0 4	+ 2 4	,,
Bembridge point	− 0 41	0 0	,,
Southampton	− 1 11	− 0 10	,,
West Cowes	− 1 26	− 1 0	,,
Hurst camber	− 1 41	− 5 6	,,
Needles point	− 1 55	− 6 0	,,
Christchurch	− 2 41		,,
Poole	− 2 31		,,
Portland breakwater	− 4 40	− 6 0	,,
Bridport	+ 0 22	− 4 0	Devonport.
Lyme Regis	+ 0 38	− 3 6	,,
Exmouth	+ 0 44	− 3 0	,,
Torbay	+ 0 17	− 1 9	,,
Dartmouth	+ 0 33	− 1 0	,,
Plymouth breakwater	− 0 6	0 0	,,
East Looe	− 0 17	+ 1 0	,,
Fowey	− 0 29	0 0	,,
Falmouth	− 0 46	+ 0 6	,,
Penzance	− 1 13	+ 1 0	,,
Scilly isles (St Mary)	− 1 16	+ 0 6	,,
WESTERN COAST OF EUROPE.			
Gibraltar	− 2 0		Brest.
Cadiz	− 1 51		,,
(Lisbon bar)	− 1 17		,,
Oporto	− 1 17		,,

WESTERN COAST OF EUROPE.	Constants.		Standard port for reference.
	Time.	Height.	
	H. M.	FT. IN.	
Ferrol	− 0 47		Brest.
Santander	− 0 17		,,
Arcachon	+ 0 23		,,
Tour de Cordouan . .	+ 0 8		,,
Bordeaux	+ 3 3		,,
Ile d'Aix	− 0 12		,,
Ile d'Yeu	− 0 19		,,
Ile de Noirmoutier . .	− 0 30		,,
Port Navalo . . .	+ 0 8		,,
St. Nazaire . . .	0 0		,,
Belle ile	− 0 9		,,
Port Louis . . .	− 0 23		,,
Port Concarneau . .	− 0 35		,,
Ouessant (Ushant) . .	0 0	0 0	,,

<p style="text-align:center">NORTHERN COAST OF EUROPE.</p>

	Time.	Height.	Standard port for reference.
Abervrach . . .	+ 0 27		Brest.
Morlaix . . .	+ 1 6		,,
Plougrescan . . .	+ 1 30		,,
Bréhat . . .	+ 2 4		,,
St Malo . . .	+ 2 18		,,
Granville . . .	+ 2 22		,,
Ile de Chausey . .	+ 2 27		,,
Jersey (St Helier) .	+ 2 42		,,
Guernsey (St Peter port) .	+ 2 50		,,
Ecrehos . . .	+ 2 45		,,
Alderney . . .	+ 3 0	− 1 6	,,
Cherbourg . . .	+ 4 13	− 1 6	,,
Barfleur . . .	+ 5 12	− 1 6	,,
La Hougue . . .	+ 5 6	− 0 6	,,
Honfleur . . .	+ 5 42	+ 3 6	,,
Quillebœuf . . .	+ 6 19		,,
Havre . . .	+ 5 31		,,
Fécamp . . .	+ 7 0	+ 4 0	,,
Dieppe . . .	+ 7 21		,,
Cayeux . . .	+ 7 27		,,
Boulogne . . .	+ 0 16	+ 5 4	Dover.
Cape Grisnez . . .	+ 0 15	+ 2 4	,,
Calais . . .	+ 0 37	+ 2 0	,,
Dunkerque . . .	+ 0 56	− 1 9	,,
Nieuport . . .	+ 1 6	− 2 4	,,
Ostend . . .	+ 1 13	− 3 9	,,
Flushing . . .	+ 1 42	− 3 10	,,
Antwerp . . .	+ 5 13	− 3 9	,,
Hellevoetsluis . . .	+ 3 18		,,
Rotterdam . . .	+ 4 33		,,
Heligoland . . .	− 0 18	− 2 6	Harwich.

I

REMARKS ON THE SET OF THE TIDAL STREAMS IN THE IRISH AND ENGLISH CHANNELS.

By Rear-Admiral F. W. Beechey, F.R.S.—1848.

With additions and amendments to 1895.

The common standard for the turn of the streams,—

A CAREFUL investigation of the tides in the Irish channel, the English channel, and in the North sea, has shown the possibility of referring the movements of the several streams to a common standard, instead of resorting to the troublesome process of comparing the motion of the streams with the varying times of high water along the coast.

is high water at Dover and Liverpool.

For the entrance of the English channel and the southern part of the North sea the time of high water at Dover may be considered the standard; and for the whole of the Irish channel, the time of the high water on the shore at the entrance of Liverpool.*

Off mouth of English channel.

Off the mouth of the English channel the stream, although materially influenced by the indraft and outset of the Channel, will be found running to the *northward and eastward*, while the water is *falling* at Dover; and to the *southward and westward* while it is *rising* at that port. The particular direction given to the stream in this part of the sea, by the meeting of the Channel and of the offing tides, will be shown in the table at p. 116 (Compartment I.); and it is only necessary to mention here, that to the

South of Scilly.

southward of the parallel of Scilly, the tidal streams of the Channel and offing blend together with varying force and direction, and occasion the direction of the stream to be constantly changing, and in some places even to make the entire circuit of the compass in one tide, without ever remaining long upon any one point; so that any written description of their course is rendered almost impossible, and the table alone must be consulted for the direction at any particular hour. From this rotatory motion of the stream, it has been asserted that a vessel can never be carried far in any one direction by it. Such, however, is not the case; for, although it may be true that while at anchor in a particular spot the vessel's head will turn to every point of the compass, yet directly she is loose she will be carried away upon a rhomb depending upon the state of the tide at Dover.

Bristol channel.

From the parallel of Scilly to the Bristol channel the stream is more regular, and while the water is *falling* at Dover, will be found setting to the *northward*: following the direction of the shore near the coast, and turning sharply round Trevose head and Hartland point into the Bristol channel; and while the water is *rising* at Dover, setting as sharply out of the Bristol channel and along the land towards Scilly.

Tidal Streams.

Hours.	Helwick Light Vessel.		Scarweather Light Vessel.		Breaksea Light Vessel.		English and Welsh Grounds Light Vessel.	
	Direction.	Rate.	Direction.	Rate.	Direction.	Rate.	Direction.	Rate.
Before { 5 H.W. { 4 Liver- { 3 pool. { 2 H.W. { 1	N.W. b. W. N.W. N.W. N.W. N.W. N.W.	Slack ⅓ to 1½ knots. 1 to 1½ „ 1½ to 2½ „ 1 to 2 „ ⅓ to 1½ „ 0 to 1 „	S. Ely. W.N.W. N.W. b. W. N.W. b. W. N.W. b. W. N.W. b. W. S.Wly.	0 to ¾ knots. 1 to 1½ „ 1½ to 2 „ 1½ to 2½ „ 1 to 2½ „ ⅓ to 1½ „ 0 to ½ „	E.S.E. W.N.W. W.N.W. W.N.W. W.N.W. W.N.W.	⅓ to 2 knots. 0 to 1½ „ 1½ to 2½ „ 2½ to 5 „ 2½ to 4½ „ 2 to 3½ „ ⅓ to 2½ „	N.E. b. E. ¼ E. S. Ely. W. b. S. ⅓ S. W. b. S. ⅓ S. W. b. S. ⅓ S. W. b. S. ⅓ S.	⅓ to 3 knots. 0 to 1½ „ 1 to 1¾ „ 1½ to 3 „ 2 to 3 „ 1½ to 2½ „
After { 1 H.W. { 2 Liver- { 3 pool. { 4 { 5	S.E. b. E. S.E. S.E. S.E. S.E.	0 to ¼ „ 1 to 1½ „ 1 to 2 „ 1 to 1½ „ ⅓ to 1 „	E.S.E. S.E. b. E. S.E. b. E. S.E. b. E. S.E. b. E.	0 to 1½ „ 1 to 2 „ 1½ to 2½ „ 1 to 2 „ ⅓ to 1½ „	E.S.E. E.S.E. E.S.E. E.S.E. E.S.E.	0 to 2½ „ 1½ to 3 „ 2 to 4 „ 1½ to 4 „ 1 to 2½ „	Wly. N.Ely. N.E. b. E. ⅓ E. N.E. b. E. ¼ E. N.K. b. E. ¼ E.	0 to 1½ „ 1 to 2½ „ 2 to 3½ „ 2½ to 4 „ 1½ to 4 „

* Although the times of high water at the entrance to Liverpool, and at Dover, are almost identical, it is considered convenient to refer the streams to the two places rather than to one.

By many observations, the light-vessel at the Seven Stones has *Seven Stones.* been found to swing to the north-going stream 7 minutes after high water at Dover; and at Trevose head this stream makes 12 minutes after high water at Dover. Advancing up the Bristol channel the turn of the stream is proportionately later, as the streams in that estuary do not follow exactly the same law as in channels which are open at both extremities. The directions of the stream in the English channel will be given hereafter; at present, the seamen's attention is called to the fact, that while the *Meeting of the* stream from Scilly is setting to the *northward* the stream from *streams in* the Irish channel will be found setting to the *southward*, and that *51° N.* these streams meet off the entrance of the Bristol channel in about the parallel of 51° and both turn into that channel. As a general *Streams* rule, in all the space eastward of a direct line joining Scilly and *between Scilly and Tuskar.* Tuskar, the stream will be found running to the eastward towards the Bristol channel, while the water is *falling* at Dover and Liverpool, and *vice versâ*: setting to the *north-east* on the southern side of the channel and to the *south-east* on the northern side. The general set of the stream in this part of the sea produces consequently, eastward of the line above mentioned, a strong *Off S. coast of* indraft towards the Bristol channel while the water is falling at *Ireland.* Liverpool, and *vice versâ*. To the westward of this line the streams appear to be slack; but further observations are required before any good description can be given of them. Towards cape Clear the northern stream from Scilly seems to join the southern and western streams from the Irish channel, and both pass to the north-west round cape Clear, and *vice versâ*.

At the Smalls lighthouse it is slack water 5 minutes before high *Off the Smalls.* water at the entrance of Liverpool; the stream sets past the rock in a S. by W. direction while the water is *falling* at Liverpool, and N. by E. while it is *rising* there, veering to the northward during the two last hours. The strength of the stream is sensibly felt hereabout and all the way from the Smalls to Pembroke, running upwards of 3½ or 4 knots at the height of springs. To the southward of the Smalls the stream sweeps round in a broad curve to the S.E., and enters the Bristol channel while the water is *falling* at Liverpool and *vice versâ*, as before stated. The *entrance of* Liverpool is properly the standard to which the turn of the stream is referred for the whole of the Irish coasts and the Irish channel, and wherever a reference is made to that place it must be understood as being 18 minutes *earlier* than the time of high water at George pier at Liverpool, to which the tide tables are adapted.

On the Irish side, at Coningbeg (Saltees) light vessel, the *Off the Saltees.* eastern stream makes shortly after low water at Liverpool, and sets for about the first 3 hours E. by S., then E.S.E. for about 2 hours, and S.E. by E. for about the last hour, when the stream slacks about three-quarters of an hour before high water at Liverpool. The western stream at first sets W.S.W. from about half an hour before high water at Liverpool to about one hour after, and then W.N.W. until low water at Liverpool.

From Coningbeg light-vessel to the Tuskar the stream sets along *Off Carnsore* the land, but towards Carnsore point begins to trend to the north- *point.* ward with the rising tide at Liverpool, and finally sets sharply round that point into the Irish channel; consequently the set experienced must be carefully watched by vessels in this situation. Near the Tuskar the north-eastern stream ceases at about high water at Liverpool.

TIDAL STREAMS ALONG SHORE ON THE SOUTH COAST
OF ENGLAND.

*Streams about
Plymouth
sound.*
The streams in Plymouth sound are tolerably regular, generally running each way about six hours and ten minutes at a mean. In Hamoaze the flood stream continues to run up, at spring tides, about fifteen minutes after high water at Devonport dockyard.

It is high water in Catwater rather earlier than at the dockyard ; but with strong winds from the southward and westward the stream flows half an hour longer in both harbours.

At the breakwater in Plymouth sound it is high water a few minutes earlier than at the dockyard, but the stream drains in for a short time after the water has ceased to rise.

Abreast of Plymouth sound, about 6 miles from the land, the streams are very irregular and turn differently to the streams in the offing. One hour and three-quarters before high water at Devonport dockyard the stream makes to the eastward and runs about E. by S. for one hour ; during the next hour it is scarcely perceptible, after which it turns to the southward, gradually changing to W.S.W. till the last quarter of the ebb on the shore, when it veers from W.S.W. to W.N.W. During the first 3 hours flood on the shore, its direction changes from W.N.W. to N.W., when it begins to slacken, and to set about North, till at the last $4\frac{1}{2}$ hours flood it runs E. by S. as at first.

Four miles south-west of the Eddystone the stream begins to run E. by S. when it is high water at Devonport dockyard (or 5 hours before high water at Dover), and continues about two hours and three-quarters, when it slacks and shifts to the southward. At $3\frac{1}{2}$ hours after high water at Devonport (or $1\frac{3}{4}$ hours before high water at Dover) it sets W.S.W. ; at 4 hours W. by N. ; and then W.N.W. until low water at Devonport. During the first 2 hours of the rising tide at Devonport, the stream sets N.W. by W., and loses its strength during the third hour, running N.W. and North. During the fourth hour, what little stream there is sets N.N.E. and N.E. and then E.N.E. and E. by N. till about high water at Devonport, when its direction is E. by S.

Off the Start.
From Bolt tail to Start point, at 4 miles off shore, at springs, the eastern stream makes at 5 hours after high water at Dover, and the western stream 2 hours before high water at Dover ; the stream sets along the land, and its greatest velocity is $2\frac{3}{4}$ knots. At neaps the turn of the stream is irregular, varying as much as 3 hours, the average being at high water at Dover and 6 hours after. Its rate at neaps is $1\frac{1}{2}$ knots : off the Start $2\frac{1}{2}$ knots.

Off Exmouth.
Off Exmouth bar, at three-quarters of a mile south of Straight point, the stream turns to the eastward at $4\frac{1}{4}$ hours after high water at Dover, and to the westward at high water at Dover, running in the latter direction about $4\frac{3}{4}$ hours. The direction of the western stream for the first 2 hours is W.S.W.; for the next 2 hours West, when it turns gradually to the northward. The direction of the eastern stream for the first quarter is E.N.E. ; at half tide, E. by N. ; and the greatest velocity of both streams is about one knot.

*Streams off
Beer head.*
Three miles south of Beer head, the stream turns to the westward half an hour before high water at Dover, and runs in that direction 4 hours, then gradually turns to the northward and runs for 2 hours between W.N.W. and N.E. by N. It may be said to turn to the eastward about 6 hours before high water at

Dover, and for $2\frac{1}{2}$ hours, or until half tide, sets from N.E. to E. by N., and for the next 3 hours gradually turns to the southward. The direction of the stream in this position is, therefore, rotatory with little or no velocity, as even at springs it scarcely runs one knot, and that only for a very short period.

Two miles N.N.W. of the bill of Portland, the streams set as *Off Portland.* follows : 4 hours before high water at Dover, South, $1\frac{3}{4}$ knots ; 3 hours before, S.W., $1\frac{3}{4}$ knots ; 2 hours before, S. by W., $1\frac{1}{2}$ knots ; 1 hour before, S.W. by S., three-quarters of a knot ; at high water at Dover, N.W. by N., weak ; one hour after high water there, from N.N.W. to N. by W., three-quarters of a knot ; 2 hours after high water there, N.N.E. to E. by N., one knot ; 3 hours after, S.E., $1\frac{1}{4}$ knots ; 4 hours after, S.E. by S., $1\frac{1}{2}$ knots ; and from 5 hours after to 4 hours before high water at Dover, S.S.E., 2 knots.

The stream therefore sets to the S.S.E. round to S.W. by S. out of the West bay of Portland, for about 9 hours, *i.e.*, from 3 hours after high water at Dover to the following high water there.

About $2\frac{1}{2}$ miles west of Portland bill the streams are of nearly equal duration, setting S.S.E. and N.N.W. The eastern stream ends about 1 hour before high water at Dover, which is $3\frac{1}{2}$ hours after high water in Weymouth harbour, or $1\frac{3}{4}$ hours before high water in Portsmouth harbour. Five miles W.S.W. from the bill the streams set S.E. by E. and N.W. by W., and turn about high and low water at Dover, or 30m. before high water in Portsmouth harbour. Six miles S.S.W. of the bill they set E.S.E. and W.N.W., and the eastern stream ends 10m. before high water in Portsmouth harbour, or half an hour after high water at Dover.

About one mile south of the bill of Portland, at half flood by the shore, or $4\frac{1}{2}$ hours after high water at Dover, the stream sets from S.S.E. to S.E. by E., and the opposite stream about W.S.W. ; the velocity of both streams, at springs, being from 5 to 6 knots ; but although they run with such violence near the Race, about one mile S.W. of the bill they are weak.

From about $1\frac{1}{2}$ miles East of the bill of Portland, to S.E. by S., three-quarters of a mile from Godnor point, the stream sets to the south-westward out of the East bay of Portland for about $9\frac{1}{2}$ hours, *i.e.*, from $4\frac{1}{2}$ hours before high water at Dover to $4\frac{3}{4}$ hours after high water there.

About one mile eastward of Portland ledge, the outset of the tidal stream from the West bay of Portland is met in the latter half of its course, at nearly right angles, by the tidal stream out of the East bay of Portland ; these united streams press on towards the Shambles, which shoal they cross obliquely at the rate of from 3 to 4 knots.

Near the west end of the Shambles, the eastern stream begins at 3 hours after high water at Dover, setting first E. by N., and finally E. by S. At 3 hours before high water at Dover it sets S.E. and gradually turns round to South and S.W., attaining a W. by S. direction at the moment of high water at Dover, and which it retains until the eastern stream makes again. The rate is from 1 to $3\frac{3}{4}$ knots.

TIDAL STREAMS AT SHAMBLES LIGHT VESSEL. *Stream at the Shambles.*

Hours.	Direction.	Rate.	Hours.	Direction.	Rate.
Before { 5 H.W. { 4 Dover. { 3 { 2 { 1 H.W.	E.S.E. E.S.E. E.S.E. E.S.E. E.N.E. W.S.W.	$\frac{1}{2}$ to 3 km. 1 to $3\frac{1}{2}$,, 1 to 3 ,, $\frac{1}{2}$ to 2 ,, 0 to 1 ,, 0 to $1\frac{1}{4}$,,	After { 1 H.W. { 2 Dover. { 3 { 4 { 5 { 6	W.S.W. W.S.W. W.S.W. W.S.W. N.E. by E.	$\frac{1}{2}$ to $2\frac{1}{2}$ km. 1 to 2$\frac{1}{2}$,, 1 to 2$\frac{1}{2}$,, 1 to 1$\frac{1}{4}$,, Turning. $\frac{1}{2}$ to 1$\frac{1}{4}$,,

In Portland and Weymouth roads the stream is scarcely per-
ceptible, running with but little strength along the shore from
Weymouth to St Albans head.

Off St Albans head. At 1¼ miles S.S.W. from St Albans head, the western stream
begins 15 minutes before high water at Dover, and the eastern
stream 5¾ hours after high water there, the latter stream setting
S.E., and the former W.N.W. to N.W. by W.; their greatest velocity
being at half tide about 4½ knots.

One mile S.E. of Durlston head, the western stream begins
half an hour before high water at Dover, and the eastern stream
5½ hours after high water there, the former setting W.S.W., and
the latter E.N.E. ; their greatest velocity about 3 knots ; the
indraught on the east-going stream in thick weather is dangerous
to a ship not on her guard.

Off Peverel point. At one third of a mile E.S.E. of Peverel point, the western
stream begins 2¼ hours before high water at Dover, and the
eastern stream 5 hours after high water there, the former setting
S.W. and the latter N.E. ; with the west - going stream, the
velocity of which is about 3 knots, there is a dangerous race over
the ledge, which extends about one mile off the point.   The
east-going stream runs at a rate of 1½ knots. Off Old Harry, at
three-quarters of a mile N.E. by E. from Standfast point, the
western stream makes 1¼ hours before high water at Dover, and
the eastern 5 hours after high water there ; the latter setting
N.E. by E. to N. by E. at the rate of one knot, and the western
stream S. by W. to S.W. 2 knots.

Caution. There is a considerable indraught on both streams into all the
deep bights from Portland to the Owers, particularly on the east-
going stream round Durlstone head into Poole bay, which will
lead into danger if not carefully allowed for. The use of the
lead in thick weather is therefore strictly enjoined as the only
safeguard.

Off the Needles. At the Needles, the western stream makes one hour before
high water at Dover, and the flood or eastern stream at
4¾ hours, after high water there, the velocity of both streams
over the Bridge and in the South channel being from 3 to
4 knots ; between Hurst point and the island, 5½ knots, and to the
southward of the Bridge about 2 knots. In the Solent, the
eastern stream makes 5 hours after high water at Dover, and near
the Bramble at 5h. 30m.*

Streams off South coast of Isle of Wight. In Freshwater bay, about one mile S.W. of Brook point, and the
same distance off Atherfield point, the western stream begins
half an hour before high water at Dover, and runs at the rate of

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* Over a considerable length of coast between Portland and Selsea bill a double
tide is experienced ; the first high water occurring more or less in consonance
with the progression of the tide from the West, the second with an apparently
counter tidal undulation from the eastward, the result being that near the
eastern limit of this section a prolonged rise of tide is caused, which, in the
Solent, develops into two distinct high waters with an interval of from one to
two hours between them, and this interval increases progressively along the
shore westward of the Needles to three and four hours, until, as Weymouth is
approached, the double tide corresponding more closely with the time of low
water becomes in fact a double low water, and is locally known as the "gulder."

At Havre, on the French coast, the high water remains stationary for one hour,
with a rise and fall of 3 or 4 inches for another hour, and only rises and falls
13 inches for the space of three hours ; this long period of nearly slack water is very
valuable to the traffic of the port, and allows from 15 to 16 vessels to enter or
leave the docks on the same tide.

one knot, and the eastern stream at 3½ hours after high water at Dover, from 2 to 2¾ knots; both streams take the direction of the coast. W. by S. 4½ miles from St Catherine point, the western stream begins at high water at Dover, setting N.W. by W. and the eastern stream 6 hours after high water there, sets in the opposite direction S.E. by E., the rate of both being from 2 to 4 knots; but at one mile W. by S. from the point the streams set N.W. by N. and S.E. by S., 3 to 4 knots, and at two-thirds of a mile S.S.W. of the point, W. by N. and E. by S., with the same velocity.

Nearly 5 miles S.S.E. of Dunnose the western stream begins 20 minutes before high water at Dover and sets W. by N., and the eastern stream, which begins 5½ hours after high water at Dover, sets East, the velocity of both being from 4 to 5 knots; but S.E. 2 miles from Dunnose, the east-going stream sets E. by N., and the west-going stream W. by S. They commence as at 5 miles S.S.E. of Dunnose.

Princessa shoal.—At the N.W. buoy, the western stream begins 1¾ hours before high water at Portsmouth, and runs 6 hours W.S.W. The eastern stream commences at 4½ hours after high water at Portsmouth, and sets very nearly in the opposite direction, E.N.E. At the S.E. buoy the streams turn about half an hour later, and set as follows, viz.: the western stream, first part, W. by S., gradually becomes more southerly, and at the last running S.W. by S. The course of the eastern stream is pretty nearly the same throughout, namely, E. by N.

DIRECTION AND RATE OF TIDAL STREAMS NEAR ISLE OF WIGHT.

Hours.	Needles Lighthouse, North, 4 miles, Full spring tide.		St Catherine Point, N.W., 4 miles, Weak spring tide.		Culver Cliff, N.W., 1½ miles, Full spring tide.		Dunnose, N.W., 6 miles, Mean tide.		Nab Light-vessel, N.N.W., 6 miles, Mean tide.	
	Direction.	Rate.	Direction.	Rate.	Direction.	Rate.	Direction.	Rate.	Direction.	Rate.
Before H.W. Portsmouth, month. 5	E.S.E.	1½ kn.	East	3½ kn.	East	2½ kn.	East	2 kn.	E.S.E.	2½ kn.
4	E.S.E.	2 ..	East	3½ ..	E. b N.	2½ ..	E. ½ N.	2½ ..	E. b S.	2½ ..
3	S.E. b E.	2½ ..	East	2½ ..	E. b N.	2½ ..	E. ½ N.	2½ ..	E. b S.	2½ ..
2	S.E. b E.	1½ ..	E. b N.	1½ ..	E. b N.	1½ ..	E. ½ N.	1½ ..	E. b N.	1½ ..
1	S.E. b E.	1 ..	W. b N.		Westerly	1 to ½ ..	E. ½ N.	0 to ½ ..	N. ½ W.	..
H.W.	W.N.W.	0 to 1..	W. b N.	2½ ..	W. ½ S.	2 ..	West	1 ..	W. b N. ½ N.	1½ ..
After H.W. Portsmouth, 1	W.N.W.	1½ ..	W. b N.	4½ ..	W. ½ S.	2 ..	West	2 ..	W. b N. ½ N.	2½ ..
2	W.N.W.	2½ ..	W. b N.	5 ..	W. b S.	2½ ..	West	2½ ..	W. b N. ½ N.	2½ ..
3	W.N.W.	2 ..	W. b N.	3½ ..	W. b S. ½ S.	2½ ..	West	2½ ..	West	2 ..
4	S.W. b W.	1 ..	W. ½ N.	1½ ..	W. b S. ½ S.	1 ..	West	1½ ..	West	1½ ..
5	N. b E.	½ to 2..	Slack		Easterly	0 to ½ ..	W. ½ S.	..	W. b N.	1 ..
6	Easterly	1 ..	East	2½ kn.	E. b N.	1½ ..	East	..	E. b S.	1 ..

At Nab rock, the tidal stream is nearly rotatory, probably caused by the Spithead stream meeting the stream coming round Dunnose somewhere near the rock; for instance, 7 hours before high water at Portsmouth, it sets East; 6 and 5 hours before, E.N.E.; 4 hours before, N.E.; 3 hours before, N.E. by N.; 2 hours before, North; one hour before, N.N.W. to N.W.; and at high water at Portsmouth, N.W. by W. One hour after high water at Portsmouth, the stream sets W. by N.; 2 hours after, W. by S. to W.S.W.; 3 hours after, S.W. by W. to S.W.; 4 hours after, S.W. by S., gradually trending to the southward until low water at Portsmouth, when it sets S.E. There are only a few minutes slack. *Spithead streams.*

At Warner shoal, the eastern stream begins 2½ hours after high water at Portsmouth, and runs 7½ hours about S.S.E.; and the western stream 2½ hours before high water at Portsmouth, runs nearly 4½ hours N.N.W.

Near the Horse Elbow, the streams must be strictly attended to, for in many cases they set directly over that shoal. The eastern stream makes $2\frac{1}{2}$ hours after high water at Portsmouth, and runs to the S.E. $7\frac{1}{4}$ hours; the western stream makes at $2\frac{1}{2}$ hours before high water at Portsmouth, $4\frac{3}{4}$ hours after low water on the shore, and runs nearly 5 hours to the N.W.

At the Dean Elbow, the eastern stream, which sets over that shoal, runs to the S.E. for 2 hours, and then sets East for the remainder of the tide, $5\frac{1}{2}$ hours; the western stream runs W.N.W. $4\frac{1}{4}$ hours. The streams are slack at about $2\frac{1}{4}$ hours before and after high water at Portsmouth.

At Spithead, the eastern stream begins $2\frac{1}{2}$ hours after high water in Portsmouth harbour, and runs 7 hours S.E. by S.; and the western stream, $2\frac{1}{2}$ hours before high water in the harbour, and runs 5 hours N.W. by N.

In Portsmouth harbour the flowing continues about seven hours, and a narrow stream runs in, fifteen or twenty minutes after high water at the dockyard. From the result of three years' observations taken at the dockyard it appears that at high water, slack water at springs continues for eight minutes, and at neaps sixteen minutes.

DIRECTION AND RATE OF TIDAL STREAMS.

Tide at Portsmouth.	Warner Light Vessel.		Nab Light Vessel.		Owers Light Vessel.	
	Direction.	Rate.	Direction.	Rate.	Direction.	Rate.
5 hrs. before H.W.	S.S.E.	1 to 1½ knots	E. b. S	1 to 1½ knots	East.	1 to 2½ knots.
4 ,, ,, ,,	S.S.E.	½ to 1 ,,	E. ½ N.	1 to 1½ ,,	East.	1½ to 2½ ,,
3 ,, ,, ,,	S.E. b. S.	½ to 1 ,,	N.E. b. E.	1 to 1 ,,	East.	1 to 2½ ,,
2 ,, ,, ,,		Turning	N. b. E	1 to ½ ,,	East.	½ to 1½ ,,
1 hr. ,, ,,	N.N.W. to N.W.	1 to 1 ,,	N.N.W. ½ W.	1 to 1 ,,		Turning
High Water.	N.N.W. to N.W.	½ to ½ ,,	N.W. ½ W.	1 to 1 ,,	West.	1 to 1½ ,,
1 hr. after H.W.	N.N.W. to N.W.	1 to 1½ ,,	W. ½ N.	1 to 1½ ,,	West.	1 to 2½ ,,
2 hrs. ,, ,,	N.N.W. to N.W.	1 to ½ ,,	W. b. S. ½ S.	1 to 1½ ,,	West.	1 to 2½ ,,
3 ,, ,, ,,	S.S.E. to South.	1 to 1½ ,,	N.S.W. ½ W.	½ to 1½ ,,	West.	1 to 2 ,,
4 ,, ,, ,,	S.S.E. to South.	1 to 1½ ,,	S. b. E.	1 to 1½ ,,	West.	½ to 1½ ,,
5 ,, ,, ,,	S.S.E.	0 to 1 ,,	S.E. ½ E.	1 to 1½ ,,	West.	0 to 1½ ,,
6 ,, ,, ,,	S.S.E.	0 to 1 ,,	E.S.E.	1 to 1½ ,,	East.	½ to 1 ,,

Streams off Selsea bill.   **Looe stream.**—At the western entrance near Pullar buoy, the eastern stream begins $4\frac{3}{4}$ hours after high water at Dover, and the western stream one hour before high water there, the streams setting S.E. and N.W. Between 2 and 3 miles outside Boulder bank, the stream turns about an hour later; the eastern stream setting E.S.E., and the western stream West. Between Pullar bank and Middle Owers, the eastern stream sets E.S.E., and the western stream West. At the eastern entrance, near Eastborough head, the eastern stream begins $5\frac{1}{2}$ hours after high water at Dover, and sets E. by N. $\frac{1}{4}$ N., and the western stream $1\frac{1}{4}$ hours before high water there sets West. Off the West end of Hooe bank, the eastern stream begin $5\frac{1}{2}$ hours after high water at Dover, and sets E.S.E., and the western stream half an hour before high water there sets West.

Off Beachy head.   At the Royal Sovereign light-vessel, the east-going stream begins about 5 hours before high water at Dover, and runs for $5\frac{1}{2}$ hours. The west-going stream makes at about half an hour after high water at Dover, and runs for $6\frac{3}{4}$ hours. The eastern stream has a maximum rate varying from $2\frac{1}{2}$ knots at springs to 2 knots at neaps; the western stream $1\frac{1}{2}$ knots.

Between Dungeness and the Downs.   Between Dungeness and Dover, the eastern stream runs E.N.E. from about $1\frac{1}{2}$ hours before to 4 hours after high water at Dover;

the stream then turns and sets W.S.W. nearly 7 hours.   Both streams
have an average rate of 3 knots at springs and 2 knots at neaps.

At the Varne light-vessel, the stream makes in an E.N.E.
direction at 2 hours before high water at Dover, and runs for
about 6 hours.   The stream in the contrary direction makes at
about $4\frac{1}{2}$ hours after high water at Dover, and runs for about
$5\frac{1}{2}$ hours.   The maximum rate of eastern stream varies from 3 to
2 knots, and of the western stream is about $2\frac{1}{4}$ knots.

About one mile S.S.E. of South Foreland lighthouse, the stream
begins to set to the eastward about 1h. 30m. before high water
at Dover, and runs from N.E. by E. to E.N.E. about $5\frac{1}{2}$ hours,
or till 4 hours after high water : it then turns and sets W.S.W.
about 7 hours.   At Dover, the flowing stream very seldom continues
more than 5 hours, and sometimes scarcely so much ; the rise and
fall being of similar duration to the eastern and western streams
respectively ; it is nearly the same at Ramsgate.   To the northward
of the South Foreland the streams change their direction to N.E.
by N. and S.W. by S.

At the South Sand head light-vessel, the north-eastern stream
begins about $1\frac{3}{4}$ hours before high water at Dover, and runs for
about 6 hours.   The south-western stream makes about $4\frac{1}{2}$ hours
after high water at Dover, and runs for about 6 hours.   As the
north-eastern stream slacks, the direction becomes more easterly,
and changes by east and south, until the south-western stream
makes ; similarly, as the south-western stream slacks, the direction
becomes more westerly, and changes by west and north, until the
north-eastern stream makes.   In fact, the stream has a rotatory
motion like the hands of a watch.   The north-eastern stream has
a maximum rate of about 3 knots, the south-western stream
$2\frac{1}{4}$ knots.*

In the Gull stream, the north-eastern stream begins about *Gulf stream.*
1h. 10m. before high water at Dover, and continues for 6 hours :
it then turns and runs in a contrary direction till $1\frac{1}{2}$ hours before
the ensuing high water.   Its direction is N.E. $\frac{1}{2}$ N. ; but the last
hour changes to E.N.E., and even to the southward of East ; the
last hour of the southern stream changes from S.W. by S. to
W.S.W., and even to the northward of West.

At the East Goodwin light-vessel the north-east going stream *East Goodwin.*
begins at high water at Dover, and the south-west 6 hours after-
wards ; the streams run 5 knots at springs.

THE TIDAL STREAMS OF THE ENGLISH CHANNEL, OUTSIDE
THE SHORE STREAMS, WITH TABLES SHOWING THEIR COURSE
AND RATE AT EVERY HOUR OF THE TIDE AT DOVER.

IN the English channel, as before stated (page 106), the time of
high water *at Dover* is taken as the standard, and whenever the
direction of the stream is required the time of the ship should
be compared with the time of high water for the day at Dover.
Knowing the interval before or after high water at Dover, and

* For the tides at the Royal Sovereign, Varne, South Sand head, East Goodwin,
Gull, and North Sand head light-vessels, *see* Compartment VI.

the position of the ship, by referring to the tables given hereafter, and to the particular area or compartment in which the vessel is situated, the direction of the stream may be readily ascertained.*

Tidal compartments.

In these tables it has been necessary to class the information under areas called compartments of the channel; for the direction in which the stream is running in one area, or compartment, may be very different to that in another, more especially in those areas where streams unite, or separate, and where what is known as an Intermediate stream prevails. The seaman must therefore look in which compartment according to latitude and longitude his vessel is situated, and in which quarter of that compartment, whether N.E., N.W., S.E., or S.W., and then enter the table for the direction of the stream.

1st compartment.

The 1st compartment is the area comprising the approach to the English channel *westward of a line joining Ushant and Scilly.*

2nd compartment.

The 2nd compartment comprises the area eastward of the before-mentioned line from Ushant to Scilly, and as far as a *line joining the Start and the Casquets,* omitting the Gulf of St Malo. In this part of the channel the streams may be considered as Intermediate, and partake of the joint directions of the streams in the first and third compartments.

3rd compartment.

The 3rd compartment comprises the area bounded on the west by the line joining the Casquets and the Start, and on the east by a line joining *Beachy head to Dieppe,* but excluding the Baie de la Seine on the south. Throughout this area what may be called the true Channel stream is experienced, which, in the fairway, will always carry a vessel *towards Beachy head* while the water is *rising at Dover,* and *from it* while it is *falling there.*

4th compartment.

The 4th compartment comprises the gulf of St Malo, an estuary which, from its magnitude and the large vertical movement of the tides throughout its area, exercises a powerful influence over the navigation of that part of the Channel in its immediate vicinity ; and the seaman must be especially on his guard when drawing near this locality. With the *falling water* at Dover the stream sets sharply *into this gulf* on both sides,† which the prevalence of westerly winds is said to increase, and with the *rising water* at Dover it sets *across* and *out of* the gulf, the north-eastern part of the stream sweeping round the Casquets towards Alderney, and through the Russel and other channels about Guernsey towards the race of Alderney.

5th compartment.

The 5th compartment comprises the area on the south side of the Channel eastward of cape Barfleur, known as Baie de la Seine. With the *rising water* at Dover the stream sets sharply round cape Barfleur *into this bay,* curving more and more as the depth of the bay is gained until it finally takes the sweep of the shore. With the east-going stream the western half of the bay is partly occupied by an eddy, and the stream slacks in all that part nearly an hour before high water at Dover, whilst in the eastern half of the bay it continues running for about half an hour after high water at Dover, so that a ship beating up channel towards

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* The time at ship to be corrected for the longitude of Dover.

† A return of the vessels wrecked on the Channel islands shows that the greater part of them ran ashore about the end of the falling water at Dover.

the end of a rising tide at Dover may, by standing close over to the French coast eastward of Havre, still keep the stream in her favour. On approaching Boulogne, however, at the beginning of a *rising tide*, great attention should be paid to the direction of the streams as given in the tables, as hereabouts they meet, and are turned down upon the French coast, so that a vessel, which on the English side would at this time have a stream setting straight up channel, here encounters one upon the beam setting, towards the Somme, and this is probably the cause of some of the many disastrous losses which have occurred in this part of the Channel.

The 6th compartment comprises the area between a line joining *6th compart-* Beachy head and the Somme on the west, and a line joining the *ment.* North Foreland and Dunkerque on the east. In this space the streams from the Channel and the North sea *meet* while the water is *rising* at Dover, and *separate* while it is *falling* there. The point of union and separation is not, however, stationary, but moves from West to East both with the rising, and falling, water. Thus, an hour after high water at Dover the separation begins off Beachy head; in two hours it has reached Hastings, in three hours Rye, and so it creeps on until at low water the line of separation has gained the line extending from the North Foreland to Dunkerque. At this time the streams on both sides of the area comprising this compartment cease running, and it is slack water all over the southern part of the North sea and English channel as far as (what is termed) the true stream extends; but the stream does not cease running throughout the whole area comprising the 6th compartment at any time; it is slack water over very small portions of the area at one time. When the water at Dover begins to rise the streams in the area on both sides of the 6th compartment set *towards Dover*, consequently the stream from the North sea *goes with the Intermediate* tide, which had not ceased running to the westward, whilst the 3rd compartment or true Channel stream, *opposes* it, and this opposition continues throughout the rising tide at Dover; the point of meeting* gradually shifting its position eastward as the water rises until about the time when the water at Dover has ceased to rise, the line of meeting has reached the North Foreland, and the streams are now slack over the Channel and southern part of the North Sea, leaving the Intermediate stream running to the eastward. An hour after high water at Dover the stream in the 2nd compartment in the Channel is setting to the westward; and in the southern part of the North Sea to the north-eastward, so that now the Inter-mediate stream runs again with the North sea stream, whilst it separates from the Channel stream in the 3rd compartment at the same point, Beachy head, as at first.

Such is the general description of the course and routine of the tidal streams of the English channel and Intermediate tide, a careful perusal of which will enable the reader the more readily to understand the directions and tables annexed.

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* The place of *meeting* begins off Beachy head at *five hours before* high water, on the *same spot* as that of the *separation* at *one hour after* high water; the place at *four hours* before high water is nearly the same as that of the separation at *two hours after*; and so on with nearly the subsequent hours.

TABLE showing the MAGNETIC DIRECTION of the STREAM in the ENGLISH CHANNEL at every HOUR of the TIDE at DOVER.

COMPARTMENT I.

Westward of a line joining Ushant and the Land's End.

Hours.		North side of latitude 49° N.						South side of 49° N.	
		West part.	Rate.	Near Scilly.	Rate.	Seven Stones L.V.	Rate.	West part.	Rate.
After high water, Dover.	1	W. by N.		N.W. by N.		N.W. to N.N.W.	o to 1 knots.	W. by S.	
	2	N. by W.		N. by W.		N. by E.	o to 1½ ,,	N.N.W.	
	3	N.E.		N. by E.		N.E. by N.	o to 1½ ,,	E.N.E.	
	4	E.N.E.	Greatest rate, springs, 1½ knots.	N. by E.	Greatest rate, springs, 1½ knots.	N.E.	½ to 1½ ,,	E.N.E.	Greatest rate, springs, 1½ knots.
	5	E.N.E.		N.E.		E.N.E.	½ to 1½ ,,	N.E. by E.	
	6	Ely.		East.		E.N.E. to E.S.E.	o to 1 ,,	Turning.	
H. W.		..		..		W.S.W. to W. N.W.	o to 1 ,,	..	
Before high water, Dover.	5	E.S.E.		..		S.E. to S.S.E.	½ to 1 ,,	S.S.E.	
	4	S. by E.		Sly.		South.	½ to 1¾ ,,	Draining.	
	3	S.S.W.		S.W.		S.S.W.	½ to 1¼ ,,	S.W.	
	2	S.Wly.		S.Wly.		S.W. ½ S.	½ to 1½ ,,	S.W. by S.	
	1	W.S.W.		S.Wly.		S.W. by W.	½ to 1½ ,,	S.W. by W.	

COMPARTMENT II.

Between { A line joining the Land's End and Ushant,   ,,   ,,   Casquets and Start, and   ,,   ,,   Casquets and Sept Iles.

Hours.		North side of the channel.						REMARKS.	South side of the channel.						
		West part.	Rate.	Centre.	Rate.	East part.	Rate.		West part.	Rate.	Centre.	Rate.	East part.	Rate.
After high water, Dover.	1	W. by N.		Wly.		Wly.			W. by S.		Wly.		W. by S.	
	2	Turning.		W.N.W.		Wly.		(W. ¾ S.) near Hurds deep.	Slack.		W. by S.		W.S.W.	
	3	North.		Wly.		W. by S.			E. by N.		Slack.		S.W. by W.	
	4	Ely.	Greatest rate, springs, 2 knots.	Slack.	Greatest rate, springs, 1½ knots.	Sly.	Greatest rate, springs, 2½ knots.		E.N.E.	Greatest rate, springs, 1½ knots.	E. by S.	Greatest rate, springs, 1½ knots.	S.E.	Greatest rate, springs, 2 knots.
	5	E. by N.		Ely.		S.E. by S.			E.N.E.		Ely.		E.S.E.	
	6	Ely.		Ely.		E. by S.			E. by N.		E.S.E.		S.E.	
Before high water, Dover.	5	E. by S.		Ely.		Ely.			East.		Ely.		E. by S.	
	4	Slack.		E. by S.		Ely.			N.E. by E.		Slack.		E. by N.	
	3	Turning.		Slack.		Ely.			Slack.		W. by N.		N. by W.	
	2	Wly.		Wly.		Turning.			S.W. Wly.		Slack.		W. by N.	
	1	W. by S.		Wly.		W.S.W.			S.Wly.		Wly.		N.W. by W.	

COMPARTMENT III.

Between { A line joining Start and Casquets, and
         „   „   point Ailly and Beachy head.

Hours.	West part.	Rate.	Centre.	Rate.	East part.	Rate.	REMARKS.	Over Hurds deep.	Rate.	Off cape Barfleur.	Rate.
After high water, Dover. 1	W'ly.	knots.	W. by N.	knots.	Turning.	knots.	In mid-channel, southward of the Isle of Wight, the western stream makes at high water at Dover, and attains a velocity of 3 knots: the eastern stream begins about 5½ hours before high water at Dover and attains a velocity of 2½ knots.	W. by S.	knots.	N.W. by W.	knots.
2	W. by N.		W.N.W.		W. by N.			W. by S.		N.W. by W.	
3	W'ly.		W.N.W.		W. by N.			W. by S.		N.W. by W.	
4	W. by S.	flood 2½ ebb	W. by N.	flood 3 3½	W'ly.	flood 1 1½		S.W. by W.	flood 5½ ebb	N.W. by W.	flood 5½ ebb
5	W. by S.		W. by N.		W'ly.			S.W. by W.		N.W. by W.	
6	N.N.E.		W. by N.		W'ly.			Slack.		N.W. by W.	
Before high water, Dover. 5	East.		E. by S.		E. by S.			E'ly.		S.E. by E.	
4	E. by S.	Greatest rate, springs –	E.S.E.	Greatest rate, springs –	E. by S.	Greatest rate, springs –		E'ly.	Greatest rate, springs –	S.E. by E.	Greatest rate, springs –
3	E. by S.		E.S.E.		E. by S.			East.		S.E. by E.	
2	E. by S.		E.S.E.		E. by S.			E. by N.		S.E. by E.	
1	E. by S.		E. by S.		E'ly.			N.E. by E.		S.E. by E.	

COMPARTMENT IV.

Entrance of gulf of St Malo on a line joining Brehat island and S.W. end of Guernsey.

Hours.	12 miles from Brehat island.		12 miles from Guernsey.		REMARKS.	Near S.W. point, Guernsey.		4 miles W. by S. from Casquets.		4 miles W.N.W of cape La Hague.	
	Course.	Rate.	Course.	Rate.		Course.	Rate.	Course.	Rate.	Course.	Rate.
After high water, Dover. 1	W.N.W.		W'ly.			W'ly.		W. by S.		S.W. by W.	
2	S'ly.		South.			S.S.W.		S.W.		S.W. by W.	
3	S'ly.	Greatest rate, uncertain.	S'ly.	Greatest rate, uncertain.		S.S.W.	Greatest rate, uncertain.	S.W.	Greatest rate, springs, 5 to 7 knots.	S.W. by W.	Greatest rate, springs, 5 to 7 knots.
4	S.E.		S.E. by S.			E.S.E.		S.S.E.		S.W. by S.	
5	S.E.		S.E. by E.			E.S.E.		S.E. by E.		S.W. by S.	
6	S.E.		S.E.			E.S.E.		S.E. by E.		N.E. by E.	
Before high water, Dover. 5	S.E. by E.		E.S.E.			{ E.S.E. / E. by N. }		E. by N.		N.E. by E.	
4	.		..			{ E.S.E. / E. by N. } ..		N.E. by N.		N.E. by E.	
3	W.N.W.		N.W.			..		N.E. by N.		N.E. by N.	
2	W.N.W.		N.W. by W.			N.N.W.		N.E. by E.		N.E. by N.	
1	N.W. by W.		W. by N.			N.N.W.		N.W.		N.E. by N.	

COMPARTMENT V.

In Baie de la Seine, south of a line joining cape Barfleur and cape Antifer.

Hours.	West part.	Rate.	Centre.	Rate.	East part.	Rate.	REMARKS.
After high water, Dover. 1	N.W. by N.	knots.	W.N.W.	knots.	W'ly.	knots.	
2	N.W. by N.		W.N.W.		W. by S.		
3	N.W. by N.		W.N.W.		W. by N.		
4	N.W. by N.	flood 4½ ebb 3½	W.N.W.	flood 4½ ebb 3½	West.	flood 3½ ebb 3	
5	N.N.W.		W.N.W.		West.		
6	Slack.		W.N.W.		W. by S.		
Before high water, Dover. 5	S.E. by S.	Greatest rate, springs	E.S.E.	Greatest rate, springs	W. by S.	Greatest rate, springs	
4	S.E. by S.		E.S.E.		E.N.E.		
3	S.E. by S.		E.S.E.		E.N.E.		
2	S.E.		E.S.E.		E.N.E.		
1	S.E.		E.S.E.		E.N.E.		

COMPARTMENT VI.*

Between { A line joining Beachy head and point Ailly, and
          ,, North Foreland and Dunkerque.

Hours.	REMARKS.	Direction of Stream.
High water at Dover .	The tidal streams separate on a line joining Beachy head and point Ailly.	
After high water, Dover. {1 2 3 4 5 6}	Line of separation shifting eastward; by the 5th hour it is near the South Foreland; and the 6th hour near the North Foreland.	Both streams setting away from line of separation.
Low water at Dover .	The streams meet on a line joining Beachy head and point Ailly.	
Before high water, Dover. {4 3 2 1}	Line of meeting shifting eastward; about an hour before high water at Dover it has reached the South Foreland; and at high water the North Foreland.	Both streams setting toward line of meeting.

* Strong easterly or westerly winds may considerably vary the time of the turn of the stream.

COMPARTMENT VI.—*continued.*

Hours.		Royal Sovereign L.V.		Varne L.V.		Southsand head L.V.	
		Course.	Rate, knots.	Course.	Rate, knots.	Course.	Rate, knots.
High water	.	East.	½ to ¾	E.N.E.	1 to 1½	N.E.	1½ to 2¾
After high water, Dover.	1	West.	¼ „ ½	E.N.E.	1½ „ 3	N.E.	1¾ „ 3
	2	West.	¾ „ 1½	E.N.E.	1½ „ 2½	N.E.	1¾ „ 2½
	3	West.	¾ „ 1¾	E.N.E.	¾ „ 1½	N.E.	1 „ 2
	4	West.	¾ „ 1½	E.N.E.	0 „ 1	E.N.E.	½ „ 1½
	5	West.	¾ „ 1¼	W.S.W.	0 „ ½	S.S.W.	¼ „ ¾
	6	West.	0 „ ¾	W.S.W.	½ „ 1¼	S.W.	1 „ 1¾
Before high water, Dover.	5	East.	½ „ ¾	W.S.W.	¾ „ 2½	S.W.	1½ „ 2
	4	East.	1 „ 2	W.S.W.	¾ „ 2	S.W.	1¼ „ 2½
	3	East.	1 „ 3	W.S.W.	½ „ ¾	S.W. by W.	1 „ 2
	2	East.	1 „ 2½	E.N.E.	½ „ ¾	W. by N.	½ „ 1½
	1	East.	¾ „ 1½	E.N.E.	¾ „ 1¼	N.N.E.	¾ „ 1

Hours.		East Goodwin L.V.		Gull L.V.		Northsand head L.V.	
		Course.	Rate, knots.	Course.	Rate, knots.	Course.	Rate, knots.
High water	.	N.E.	0 to 2¾	N.E. ½ N.	½ to 2	N.N.E.	½ to 1¾
After high water, Dover.	1	N.E.	½ „ 4	N.E. ½ N.	1 „ 2½	N.N.E.	¾ „ 3
	2	N.E.	1 „ 5½	N.E. ½ N.	1¼ „ 3	N.N.E.	1 „ 3
	3	N.E.	1 „ 4¼	N.E. ½ N.	1¼ „ 2¾	N.N.E.	1 „ 2¾
	4	N.E.	1 „ 3¼	N.E. ½ N.	¼ „ 2	N.N.E.	¾ „ 1¾
	5	N.E.	0 „ 2	Turning.	..	N.N.E.	¼ „ 1¾
	6	S.W.	0 „ 1¼	S.W.	½ „ 1½	S.S.W.	¼ „ 1¾
Before high water, Dover.	5	S.W.	½ „ 2¾	S.W. ¼ W.	1 „ 2¾	S.S.W.	¾ „ 2½
	4	S.W.	1¼ „ 5¼	S.W. ½ W.	1¼ „ 3	S.S.W.	1 „ 3¼
	3	S.W.	1½ „ 4	S.W. ½ W.	1½ „ 2½	S.S.W.	1 „ 2½
	2	S.W.	1 „ 3½	S.W. ½ W.	½ „ 2½	S.S.W.	½ „ 2
	1	S.W.	0 „ 2½	N.E. ½ N.	½ „ 2	Turning.	..

REMARKS on the TIDAL STREAMS near the CHANNEL ISLANDS,
by STAFF COMMANDER J. RICHARDS, R.N.

Near Guernsey and to the northward of that island the true
Channel stream prevails; the great body of the water running
about E. by N. whilst the tide is *rising* at Dover, and about
W.S.W. when it is *falling* at that place; but near Roches Douvres
to the southward, the stream sets S.E. into the gulf of St Malo,
from 2 hours after high water at Dover to 4 hours before high
water there, and N.W. during the remainder of the tides.

Thus what is called *tide and half tide* prevails at Guernsey and
amongst the islands to the northward; whilst at Jersey, and along
the southern shore of the gulf, and out to the westward towards
Roches Douvres, the stream is more uniform and regular; the
former resulting directly from the action of the Channel stream,
the latter from an interruption of the southern portion of that
stream by the coast of France, and its diversion into the gulf of
St Malo.

The centre of Deroute channel (between Roches Douvres and
Guernsey) may be considered to mark the separating boundary of
these two streams; for along this line and to the eastward they
successively run together side by side, blend, and separate in
alternating direction and force, depending on the state of the
tide.

It should here be noted that the tidal stream around and
between the Channel islands has a rotatory motion (evidently caused
by the different action of the above-described two streams and the
peculiar form of the shores of the gulf) from right to left, going
right round the compass in little more than twelve hours.

It is also worthy of remark that in consequence of these
differences, the action of the streams near the northern and
southern parts of the gulf are the reverse of each other, the
stream being slack near Roches Douvres and along the southern
shore of the gulf, whilst it is running at its maximum rate north-
ward of cape La Hogue and Alderney, and *vice versâ*.

About the time of half ebb at Dover, and the first quarter flood
by the shore at Guernsey, the stream sets sharply into the gulf on
both sides, and continues to run in south-easterly until a little
after half flood by the shore, and slack and change of stream in the
offing, both of which occur nearly simultaneously with low water
at Dover. A division of the Deroute stream now takes place, the
northern part sweeping to the E.N.E. through the Russels, Swinge,
and Race channels, and then uniting with the east-going channel
stream to the northward of Alderney, the southern part near
Roches Douvres setting into the depth of the gulf to the S.E., past
Jersey and Minquiers, until high water by the shore; after which,
although the main body of the stream to the southward slacks, its
northern border turns off to the N.E. past Jersey, and into the
Deroute stream.

The stream begins to run out of the gulf to the westward,
close in along its southern shore, soon after high water, but
farther out in the channel within Roches Douvres not till an hour

later. At a position N.W., eight miles from Roches Douvres, the stream changes at two hours ebb, and farther to the northward near Guernsey (as already noticed) the slack and change of stream takes place soon after half ebb by the shore, at which period the W.S.W. stream also makes down through the Race, Swinge, and Russels channels.

In the offing westward of Guernsey, the stream seldom attains a rate of 3 knots until the island is approached within four or five miles, where it increases to $4\frac{1}{2}$ knots; in the Russel channels it exceeds 5 knots, and it runs about the same rate between Jersey and the Minquiers; in the centre of Deroute channel, between Jersey and Sark, its strength is barely 4 knots, and 3 knots farther westward between Guernsey and Roches Douvres; near Roches Douvres the rate appears to be $3\frac{1}{2}$ knots; in the offing north of Alderney and the Casquets, $5\frac{1}{2}$ knots is not an uncommon rate for an ebb spring tide, and on similar occasions the Race and Swinge streams run more than 7 knots.*

The rapidity with which the tides rise and fall and their velocity are greatly influenced by strong north-eastern and south-western gales; the former retarding and the latter accelerating their progress in a remarkable degree; the latter will also cause the Race stream to run three-quarters of an hour longer to the north-eastward than usual, although the former has not a similar effect upon the stream when running to the south-westward.

TIDES AROUND IRELAND.

TIDES.—The main tidal undulation from the Atlantic approaches Ireland from a south-westerly direction (true), the line of the crest of the undulation running north-west and south-east, so that it reaches the south-west extreme of Ireland at almost precisely the same time it arrives at Ushant. In the open ocean, where the depths are great, this undulation or tidal wave does not appear to exceed 5 feet in height, from trough to summit; or in other words the oceanic tidal range at springs is somewhere about 5 feet; but when the undulation reaches the submarine bank, on which the British islands are situated, its height is increased, and is still further augmented when it reaches the coast, so that this undulation is in some part as much as 25 feet from crest to trough, and even reaches a height of 50 feet in the upper part of the Bristol channel.

The undulation which approaches our coast from the Atlantic has the peculiarity of a greater elevation at its south-east part than elsewhere; the height of the crest from the trough being about 10 feet at the south-west part of Ireland, and 19 feet at Ushant; and this peculiarity it preserves in its progress up the Irish, Bristol, and English channels, the range of tide, or height of the undulation, being invariably greater on the southern and eastern sides of the channels than on the northern and western sides.

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* The average duration of the flood stream is $5\frac{3}{4}$ hours and of the ebb $6\frac{3}{4}$ hours.

The tidal undulation on striking the south-west extreme of Ireland is split into two parts; one, the northern, making it successively high water along the western shores of Ireland and Scotland; whilst the other, the southern, makes successive high water along the south coast of Ireland and north coast of France, and is finally sub-divided into three undulations: viz., the tidal wave travelling up the English channel, that up the Bristol channel, and the third up the Irish channel.

The undulation reaches Tory island off the north-west point of Ireland 1¼ hours later than Dursey head, its height from crest to trough being about 10 to 13 feet at springs.

After passing Tory island, however, its rate becomes slower in the shallower water, and it occupies 4½ hours in travelling to the narrow channel between Fair head and the Mull of Cantyre, a distance of 75 miles; here its height is only 4 feet from trough to crest.

The southern portion of the undulation arrives at the line joining Tuskar rock to Milford haven about 1¾ hours later than at Dursey head, its height varying from 9 to 12 feet on the Irish coast, and from 16 to 27 feet on the English coast. After passing the imaginary line joining Tuskar and Milford haven, the undulation moves up the Irish channel at a rate of about 30 miles an hour, and assumes apparently a convex form in plan, its height varying from 2 to 13 feet on the Irish coast and from 14 to 25 feet on the Welsh and English coasts, being an average of 11 feet higher at springs on the eastern coasts of the Irish channel than on the western coasts.

It will be thus seen that the tidal undulation after striking the south-west coast of Ireland is divided, and passing round Ireland is again united in the Irish sea.

This description of the tidal undulation, or vertical movement of the waters, must not be confounded in any way with the lateral movement of the surface water, or in other words, the set of the tidal streams. The description of the streams is given in the following paragraph.

TIDAL STREAMS AROUND IRELAND.

TIDAL STREAMS.—The tidal streams round Ireland consist of two pairs of uniting or separating tides, the points of junction or separation of which are not constant in position but partake of the characteristic of what is known as the Intermediate stream in the English channel. For convenience of description these streams are divided into—

  (*a*) Those streams which, over a considerable extent of coast, run for six hours in one direction and six hours in the other, the change of direction being practically simultaneous, and

  (*b*) Those streams which do not turn simultaneously, and which have a movable line of junction or separation.

1. On the west coast of Ireland, from the parallel of the river Shannon to Tory island, the stream changes simultaneously; running in a direction from the Shannon towards Tory island from 3 hours after high water at Liverpool to 3 hours after low water; and from Tory island towards the Shannon from 3 hours after low water at Liverpool to 3 hours after high water. In the offing these streams have a general north-east and south-west direction; near the land they follow the trend of the coast.

2. In the North channel into the Irish sea the tidal streams between a line joining Rathlin island to the Mull of Cantyre, and another line joining the Isle of Man to Morecambe bay, also change simultaneously; running towards Liverpool when the water is rising there, and away from it when falling there.

3. In the space between Tory and Rathlin islands there is an Intermediate stream; for here the stream prevailing along the west coast of Ireland unites with, or separates from, the stream through the North channel. The line of junction or separation begins at Tory island and works gradually eastward to Rathlin island. During the first three hours of the rising tide at Liverpool, the entire stream from the Shannon round the west and north coasts of Ireland flows towards the North channel and into the Irish sea; and during the first three hours of the falling tide at Liverpool, the stream flows in a continuous line from the Irish sea out of the North channel along the north and west coasts of Ireland towards the Shannon.

4. On the south-west and south coasts of Ireland, the stream between the Skellig rocks and the entrance to Cork harbour also changes simultaneously; running round from the Skelligs towards Cork harbour from 3 hours after high water at Liverpool to 3 hours after low water there; and from Cork harbour round Dursey head towards the Skelligs from 3 hours after low water at Liverpool to 3 hours after high water there.

5. Between the river Shannon and the Skelligs there is an Intermediate tidal stream, for as the stream on the west coast of Ireland changes at the same time as the stream on the south-west and south coasts (between the Skelligs and Cork), only always running in opposite directions, there must be a line of junction or separation; this line is at the Skelligs at 3 hours after high or low water at Liverpool; off Valentia island at 4 hours after high or low water at Liverpool; off the Blasket islands at 5 hours after high or low water at Liverpool; off Smerwick harbour at high or low water at Liverpool; off Brandon bay at one hour after high and low water at Liverpool; and off Kerry head at 2 hours after high or low water at Liverpool.

6. In the Irish channel, between a line joining Carnsore point to the Smalls and another line joining the Isle of Man to Morecambe bay, the change of stream is also practically simultaneous; running in towards the Irish sea when the water is rising at Liverpool, and outwards from the Irish sea when the water is falling at Liverpool. This stream therefore changes at the same time as the stream through the North channel, but the two streams run in opposite directions, their line of junction or separation being between the Isle of Man and Morecambe bay. Between the Isle of Man and the Irish coast the water rises and falls without any perceptible stream.

7. Between Cork harbour entrance and Carnsore point is a third Intermediate stream, as in this space the stream round the south-west part of Ireland unites with, or separates from, the stream running in or out of the Irish channel. At 3 hours after high or low water at Liverpool the line of junction or separation is off Kinsale head; at 4 hours after high or low water at Liverpool it is off Ballycottin bay; at 5 hours after high or low water at Liverpool it is off Dungarvan bay; at high or low water at Liverpool it is off Tramore; and from low or high water at Liverpool to 3 hours after the entire stream from the Skelligs round the south-west and south coasts of Ireland, is setting either towards or from St. George's channel and into the Irish sea, as is precisely the case at this time with the stream along the west and north coasts of Ireland.

It will perhaps aid the mariner if a description of the direction in which the streams are setting is given for each hour of the rising and falling tide at Liverpool.

(*a*). **At 6 hours before high water at Liverpool.**—The tidal stream is slack in the North channel, the Irish sea, and St. George's channel. On the south-west and south coasts of Ireland the stream is running from Smerwick bay south round Dursey head and cape Clear, and then east towards Carnsore point; whilst on the west and north coasts it is running north-easterly from Smerwick bay towards Tory island, and from thence in an easterly direction to Rathlin island.

(*b*). **At 5 and 4 hours before high water at Liverpool.**—The streams round the entire coasts of Ireland are moving towards the Irish sea, the point of separation being off Brandon bay, on the west coast; and the point of junction an imaginary line from the Isle of Man to Morecambe bay.

(*c*). **At 3 hours before high water at Liverpool.**—The stream on the west coast from the river Shannon to Tory island is slack, as is also the stream on the south and south-west coasts from the Skelligs to Cork. Eastward of Cork the stream continues running to the eastward towards Carnsore point and through St. George's channel; whilst eastward of Tory island on the north coast the stream continues running toward Rathlin island, and through the North channel into the Irish sea. Between the Shannon and the Skelligs the Intermediate stream is running to the south-westward.

(*d*). **At 2 hours before high water at Liverpool.**—The stream on the west coast of Ireland, from lough Swilly on the north to Valentia island on the west, is running to the south-westward; whilst on the south and south-west coasts it is running west from Ballycottin bay to cape Clear, and thence in a northerly direction to Valentia island. Eastward of lough Swilly, on the north coast, the stream sets towards Rathlin island, and continues through the North channel into the Irish sea; and eastward of Ballycottin bay, on the south coast, it sets towards Carnsore point and up St. George's channel.

(*e*). **At 1 hour before high water at Liverpool.**—On the north coast the streams split at Inishtrahull island, the eastern part running towards Rathlin island and through the North channel into the Irish sea ; the western part towards Tory island, and from thence in a south-westerly direction to the Blasket islands ; here it meets the stream running round the south and south-west coasts. On the south coast the stream splits off Dungarvan bay, east of which it sets towards Carnsore point and through St. George's channel ; and west of Dungarvan bay it sets to the westward, round cape Clear, and then north towards Blasket islands.

(*f*). **At high water at Liverpool.**—The stream is slack over the North channel, the Irish sea, and St. George's channel. On the north coast of Ireland the stream is slack or setting slowly from Rathlin island towards Tory island, and thence south-westward towards Brandon bay, where it meets the stream round the south and south-west coasts. On the south coast the stream is setting west from Carnsore point to cape Clear, and from thence in a northerly direction to Brandon bay.

(*g*). **At 1 and 2 hours after high water at Liverpool.**—The streams separate in the Irish sea between the Isle of Man and Morecambe bay, and run in opposite directions round the coasts of Ireland, meeting again off Kerry head.

(*h*). **At 3 hours after high water at Liverpool.**—The stream is slack on the west coast of Ireland between the river Shannon and Tory island, and on the south-west and south coast from the Skelligs to Cork harbour; the intermediate stream between the Skelligs and the Shannon is running to the north-eastward. On the north coast the stream is running out of the North channel, and thence westward to Tory island ; whilst on the south coast it is running out of St. George's channel, and thence westward towards Cork harbour.

(*i*). **At 4 hours after high water at Liverpool.**—The stream on the west coast of Ireland is running north eastward from Valentia island to lough Swilly, on the north coast, off which it meets the stream running out of the North channel, and westward along the north coast of Ireland. On the south-west and south coasts the stream runs south from Valentia towards cape Clear, and thence in an easterly direction to Ballycottin bay, off which it meets the stream which, running out of St. George's channel, pursues a westerly course from Carnsore point to Ballycottin.

(*k*). **At 5 hours after high water at Liverpool.**—The stream on the west coast is running north-eastward from the Blasket islands towards Tory island, and thence eastward to Inishtrahull island, where it meets the stream, which, running out of the North channel, takes a westerly course from Rathlin island.

(*k*)   On the south-west and south coasts the stream runs in
continued. a southerly direction from the Blasket islands towards
cape Clear, and thence easterly to Dungarvan bay, in the
neighbourhood of which it meets the stream, which,
after running out of channel, takes a westerly direction
from Carnsore point to Dungarvan.

It will be observed that in the foregoing description, the ex-
pressions " flood tide ; " " ebb tide ; " " flood stream ; " and " ebb
stream " are carefully avoided. These terms are not applicable to
the set of the streams on open coasts, and can only be properly
used when the stream runs in one direction whilst the water is
rising in the locality, and in the other when it is falling in the
locality. By naming the stream (roughly) after the magnetic
direction in which they are setting, and giving the time of change,
it is hoped that a clearer account is given, and one that cannot be
misunderstood.

It must, however, be remembered that the foregoing is only a
general account of the set of the streams, and that particular
localities require particular descriptions.

The strength of the streams.—Near all the salient points
round the Irish coast, through the various sounds, and through
the Irish channel the strength of the stream is considerable ; a
rate of three knots an hour is not uncommon, and this increases
to 4 or 5 knots in St. George's channel, and even reaches 6 knots
in the North channel. In the offing along the south, west, and
north coasts of Ireland the stream is weak, and seldom exceeds a
knot or $1\frac{1}{2}$ knots an hour.

At the distance of 70 miles to the westward of cape Clear, the
stream runs for 4 hours between S.W. and W. by S., and for 8 hours
between W. by N. and N.N.E., and not at all to the eastward or
south-east ; to which circumstance may be attributed the northerly
and westerly set experienced by some ships in this locality.
Twenty-four miles to the southward of cape Clear the first of the
ebbs set S.W., veering round to West and N.W. The first of the
flood sets N. by E., veering round by East to S.S.E., at the rate of
from three-quarters to $1\frac{1}{2}$ knots per hour.

Six miles south-west of Seven heads the stream runs to the
eastward until half-ebb by the shore, when it slacks for an hour
and afterwards runs west, until half-flood by the shore, when
another hour's slack intervenes before re-commencing its eastern
course. The rate seldom exceeds $1\frac{1}{4}$ knots per hour. Near the
coast the stream takes the direction of the shore and is slack from
half an hour to an hour at each change of tide. In the offing,
however, there exists no inactivity, the stream preserving its
constant revolving motion, generally with the sun.

CAUTION.—In making allowance for the different sets and
velocities of the tidal stream ; on this, as on nearly all other coasts,
there is an indraught into the bights which should be duly allowed
for, and as the prevailing wind is westerly, on the west coast of
Ireland, the prevailing surface drift will be towards the land and
to the northward. Though it is probably not of much strength as
affecting the place of a ship, much consideration is due to the
force and direction of the wind, and this general drift must not
be forgotten.

THE TIDES NEAR RATHLIN ISLAND.

By Captain Richard Hoskyn, R.N.

About Rathlin island the tidal streams are very rapid, in Rathlin *Rate of* sound they run from 4 knots at neaps to 6¼ knots at springs, *stream.* occasioning strong eddies along the shores, with heavy overfalls off all the headlands.

On each side of Tor point there is an eddy which at half tide *Eddy from* gradually extends from the shore; at the last quarter of the *Tor point* channel flood this eddy goes to the westward through Rathlin *through the* sound, causing the ebb stream to make there 1½ hours sooner than *sound.* it does to the northward of the island; by taking advantage of these eddies, a vessel from the southward may carry 9 hours' tide with her through Rathlin sound.

To the westward of Fair head all along the south shore of the *Eddy on south* sound as far as Sheep island there is an eddy with both streams, *shore.* commencing at half tide. Carrickvaan rock lies at the junction of the eddy and true streams.

During the first and half, the western stream sets round Rue *Western* point into Church bay, but after high water at Liverpool, when *stream.* the general stream north of the island has made to the westward, and it has attained a rate of 6¼ knots through the sound, an eddy *Eddy in* begins in Church bay, setting from Bull point towards Rue point, *Church bay.* and meeting the true stream about a mile westward of the latter, where the bottom is very irregular, a great overfall is occasioned, *Dangerous* named Slough-na-more, which may endanger small vessels. *overfall.*

The eddy from Church bay has now forced the main stream *Direction of* more southerly, with contracted limits it sets from Rue point *ebb.* towards Carrickvaan rock, whence it shoots off in a N.W. direction towards Bull point, meeting there the stream from the north side of the island setting to the S.W.

The eastern stream does not begin in the middle of the sound *Eastern* until it is low water at Liverpool, although, as before observed, *stream.* the eddy along the south shore commences at half tide. There is no slack water preceding the east-going stream; in the eastern part of the sound at low water it sets south 2½ knots, in the western part at the same moment it sets north 1¾ knots, eddying round at each station in opposite directions. The stream soon becomes general, setting fair through the sound, and rushing out of Church bay past Rue point with great force, joins the eddy before alluded to, and sets for 10 hours across Church bay to the eastward, at which time there is an eddy to the eastward of *Eddy to east-* the island, extending 2½ miles from the shore and setting back on *ward of* the island; at the junction of the eddy and true streams there are *island.* great overfalls off Altacarry head, and again off Rue point as mentioned above.

With a commanding breeze there is no danger in the navigation *Navigation* of Rathlin sound, but in light winds great vigilance is necessary *sound.* to avoid being caught in the eddies or overfalls.

Off Bengore head, at a mile distant, the stream turns about 15 *Streams off* minutes after high and low water at Liverpool; springs run 3 knots, *Bengore head.* the ebb setting W.N.W. and the flood E. by S. In the bays on each side of the heads, an eddy begins when the stream in the offing has run half its course.

Streams near the Skerries. At the Skerries, with the falling tide at Liverpool, the stream sets fair through the anchorage and sound to the westward, attaining a velocity of 3 to $3\frac{1}{2}$ knots, in its passage between Ramore head and Carr rocks, and creating a very troublesome sea.

With the rising tide at Liverpool, the stream sets from Ramore head towards Carr rocks; when the sound is entered it sets fairly through.

In Broad sound it sets down on Little Skerry, while the west-going stream inclines to the northward through the sound.

At an anchorage under Great Skerry there is little stream, on the flood it is slack water at half tide, on the ebb with the last quarter, while on the north side of the rocks the stream runs with a velocity of 3 knots.

To the west-ward. Proceeding to the westward towards lough Foyle, the stream loses much of its strength, north of Bann river entrance, 3 miles off shore, its average rate at springs is $1\frac{3}{4}$ knots.

Eddy. There is an eddy tide along the shore from the Skerries to Bann river entrance, commencing at half tide, the line of its junction with the main stream being marked by a strong rippling.

Off port Stewart. Two miles north of port Stewart the channel stream turns to the eastward one hour and 40 minutes after low water at Liverpool, or at high water on the adjacent shore, and to the westward 30 minutes after high water at Liverpool, or three-quarters of an hour before low water on the adjacent shore, so that, on this part of the coast, the tide wave (with reference to its head at Liverpool) *High and low water not occasioned by tidal stream,* being nearly reversed, we witness (what to a person watching the rise and fall of the tide on the shore appears at first sight so anomalous) the whole of the ebb stream coming from the ocean, while the flood comes from the opposite quarter.

but by tidal wave. Referring the tidal stream to the head of the tide at Liverpool, and the varying times of high water to the undulation of the tide wave, this apparent anomaly disappears.

Ground swell. All this coast to the westward of Fair head is subject to a ground swell, in fine weather the commencement of the east-going stream is made apparent by the sudden appearance of the swell, resuming again a comparative state of quiet when the west-going stream makes.

THE TIDAL STREAMS OF THE IRISH CHANNEL, WITH TABLES SHOW-
ING THEIR COURSE AND RATE WHEN AT THEIR GREATEST
STRENGTH.

Streams turn with the tides of Liverpool and More-cambe bay. IN the Irish channel, as before observed, experiments have shown that, notwithstanding the variety of times of high water through-out the channel, the turn of the stream over all that part which may be called the fair navigable portion of the channel is nearly simultaneous; that the northern and southern streams in both channels commence and end in all parts (practically speaking) at nearly the same time; and that that time happens to correspond nearly with the time of high and low water on the shore at *the entrance* of Liverpool and of Morecambe bay,* a spot remarkable

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* The entrances of Liverpool and of Morecambe bay are, as before stated, 18 minutes earlier in their times of high water, than those given for Liverpool in the tide tables.

At N.W. L.V., Liverpool bay, the flood stream sets in an E.S.E. direction, with a maximum rate at springs of $2\frac{1}{4}$ knots; the ebb W.N.W., 2 knots. At neaps the flood sets at the rate of one knot, the ebb three-quarters of a knot.

as being the point where the opposite streams coming round the extremities of Ireland terminate. So that it is necessary only to know the times of high and low water at either of these places, to determine the hour when the stream of either *tide will commence or terminate in any part of the channel.* For this purpose the Liverpool tide table may be used, subtracting a quarter of an hour from the times there given, in consequence of the high water at George pier being later than the point which is considered as the head of the tide.

The tidal undulation from the Atlantic enters the Irish channel *Streams enter* by two channels; of which Carnsore point, the S.E. point of *north and south of* Ireland, and St. David head, the S.W. point of Wales, are the *Ireland.* limits of the southern one; and Rathlin and the Mull of Cantyre the boundaries of the northern.

The axis of the in-going stream runs nearly in a line from a *Southern* point midway between the Tuskar and the Bishops, to a position *streams from* 16 miles due west of Holyhead; beyond which it begins to expand *Tuskar to the Isle of Man.* eastward and westward; but its main body preserves its direction straight forward towards the Calf of Man, which it passes to the eastward with increased velocity as far as Langness point, and then at a more moderate rate on towards Maughold head. Here it is arrested by the southern stream from the North channel coming round the point of Ayr, and is first turned to the eastward by it, and then goes with it at an easy rate direct from Morecambe bay; thus changing its direction nearly eight points.

The parts of the stream farthest from its axis are necessarily *Eastern* deflected from the course of the great body of the water by the *branch of S.* impediments of banks on the Irish side of the channel, and by *stream sets into Cardigan* the tortuous form of the coast on the Welsh. The eastern portion *bay.* passing Linney head, rushes with great rapidity between the Smalls, Grassholm, and Milford haven towards the Bishops, which it passes at a rate of between 4 and 5 knots; sets sharply round those rocks in an E.N.E. direction over Bass bank, and into Cardigan bay; makes the circuit of that bay, and sets out again towards Bardsey, at the other extremity of it; then sweeping to the N. by W. past the island and through the sound, it gradually takes the course of the shore, round Carnarvon bay, and into Menai strait as far as Bangor; but the stream still continuing outside towards South Stack, which it rounds, setting towards the Skerries at a rate of upwards of 4 knots; and, finally, turns sharp round those rocks for Liverpool and Morecambe bay: completing in its way the high water in the Menai, and filling the Dee, the Mersey, and the Ribble.

The western part of the stream, after passing the Saltees, *Western* runs nearly in the direction of the Tuskar, sets sharply round it, *branch sets over the Irish* and then takes a N.E. direction, setting fairly along the coast, *banks.* but over the banks skirting the shore, so that vessels tacking near the inner edge of the sands with the north-east going stream, and on the outer edge on the opposite stream, have been carried upon them and lost, especially upon the Arklow and Codling banks. Abreast of Arklow is situated that remarkable spot in the Irish *Off Arklow,* channel, where the tide scarcely either rises or falls. The stream *no rise or fall.* notwithstanding sweeps past it at the rate of 4 knots at springs, and reaches the parallel of Wicklow head. Here it encounters an extensive projection of Codling bank; and while the outer *Codling bank.* portion takes the circuit of the bank, the inner stream sweeps

over it, occasioning an overfall and strong rippling all round the
edge, by which the bank may generally be recognised. Beyond
this point the streams unite and flow on towards Howth and
Lambay, growing gradually weaker as they proceed, until they
ultimately expend themselves in a large space of still water
situated between the Isle of Man and Carlingford. There we
have not been able to detect any stream ; for there another remark-
able phenomenon occurs — the water rising and falling without
apparently any perceptible stream. This space of still water is
marked by a bottom of blue mud. Such is the course of the
flowing water of the Southern channel.

Stream ends Carlingford. No stream there.

In the North channel the stream enters between the Mull of
Cantyre and Rathlin island simultaneously with that passing the
Tuskar into the Southern channel, but flows in the contrary
direction. It runs at the rate of 3 knots at springs, increasing to
5 knots near the Mull, and to 4 near Tor point, on the opposite
side of the channel. The eastern branch of this stream turns
round the Mull towards Ailsa and the Clyde, a portion passing
round Sanda up Kilbrennen sound and loch Fyne. The main
body sweeps to the S. by E., taking nearly the general direction of
the channel, but pressing more heavily on the Wigtonshire coast.
Near the Mull of Galloway the stream increases in velocity to 5
knots ; the eastern portion turns sharply round the promontory
towards the Solway, and splits off St Bees head, one portion
running up the Solway and the other towards Morecambe bay.

Northern stream from Rathlin to the Clyde.

The axis of the stream midway between the Mull of Galloway and
Copeland island presses on towards the northern half of the Isle of
Man ; and while one portion of it flows towards the point of Ayr,
the other makes for Contrary head, and is there turned back to
the N.E. at a right angle nearly to its early course.   Passing Jurby
point, it re-unites with the other portion of the stream and they
jointly rush with a rapidity of from 4 to 5 knots round the point of
Ayr, and directly across all the banks lying off there, and catching up
the stream from the south channel off Maughold head, they hurry
on together towards that great point of union, Morecambe bay.
This bay, the grand receptacle of the streams from both channels,
is notorious for its hugh banks of sand, and also remarkable
for a deep channel scoured out by the stream, and known as
the Lune deep, which is the great beacon to all vessels bound
to that place.

Central portion of this stream sets to Isle of Man and More-cambe bay.

Lune deep.

We have now only to speak of the *western limit* of the stream,
which was left off Tor point running at a rate of 4 knots off the
pitch of the point.   Hence it strikes directly towards the Maidens,
boiling over the Highlander and Russel rocks, and other reefs in
the vicinity of that dangerous group : and takes the direction of
the coast again from Muck island to Black head, at the entrance of
Belfast lough, which it fills.

Western branch of north stream to Maidens and Belfast.

The portion of the stream which sets into Belfast lough splits
off Grey point ; one portion flowing up towards Garmoyle, while
the other bends back along the shore of Bangor, Groomsport, and
Orlock, and blends with the general stream which has come on
from the Maidens and Black head in nearly a straight line, and
passes with it through the sounds of the Copeland islands. Hence
it proceeds along the coast, brushes the South rock, and runs on
towards St. John point ; off which the stream, like that coming
from the southward, expends itself in the large space of still

Belfast lough.

water, which remains almost undisturbed, although pressed upon by streams from various quarters.

Such is a general description of the streams in the Irish *In-going* channel, which are produced by the rising undulation, or *streams.* which, for the purpose of distinction, we may designate the *in-going streams.*

The ebbing or *out-going streams* do not materially differ from *Out-going* the reverse of those, except that in the southern channel they *streams.* press rather more over towards the Irish coast.

These observations do not, however, extend beyond the points *Limits of the* where the channels begin to open out, that is, beyond a line join- *above streams.* ing Rathlin and the Mull of Cantyre on the north, and the Saltees and Pembroke on the south. Outside of these limits, the waters diverge right and left; that on the north joining the stream from Jura, and turning sharp round Rathlin; that on the south, speaking now of the out-going stream, sweeps past St. David head into the Bristol channel on one side, and on the other rounds the Tuskar, and passes on to Waterford.

TABLE SHOWING THE MAGNETIC DIRECTION AND RATE (AT SPRINGS) OF THE TIDAL STREAMS IN THE IRISH CHANNEL.

In the following table, the direction of the stream, as it runs at *Explanation.* its greatest strength, is given at four places upon lines connecting well known headlands, viz., at 5 miles from the shore, on each side of the channel, and at a third of the distance across the channel from each of those headlands. The names of the places will be found in the marginal columns; and in the adjacent column, a brief description of the course of the streams in the immediate vicinity of each headland. The western part of the stream will be found on the left hand page, and the eastern half on the right hand page.

To use the table, take the line nearest to your position, and at the distance across the channel which answers best to your distance from the land, take out the direction of the stream from its column; or if the place of the ship falls between two divisions, take the mean of the two directions given in the columns for the direction of the stream at that time. To know when the stream will turn, look in the Tide tables for the time of high water at Liverpool, for the day, and about a quarter of an hour before that time the stream will begin to *set out* in both the North and the St. George's channels, and will run in that direction until about 45 minutes before low water, when the general slack water begins. The slack water in the offing is usually spread over an interval of an hour—from the cessation of one stream to the beginning of the next.

In these tables { F stands for *flood* or *rising* tide at Liverpool.
{ E stands for *ebb* or *falling* tide at Liverpool.

As a rough general rule, in the fair way of the channel a vessel will be carried 9 miles by the stream in a whole tide at springs, and at neaps about 6 miles; but near to the land on either side, or to the banks, the rate of the stream greatly increases.

The rates given in the table which follows are at spring tides; and in order to adapt them to neaps, one third may be subtracted from them.

TABLE showing the DIRECTION and RATE (at SPRINGS)

Position.	Remarks on the tides near the land.	From	At 5 miles distance.		½ over.		
				Rate.		Rate.	
On a line joining Tuskar and St. David head.	The stream curves with the land and slacks in shore 1½ hours before the offing, and inside Long bank 2½ hours before Liverpool, the stream setting over the bank N. by W. & S.W.	Tuskar.	N.E.	3	N.E. by E.	2½	F
			S.W.	3	S.W. by W.	2½	E
On a line joining Arklow light-vessel and Barrisey island.	Near Arklow bank the stream slacks half an hour before it does in the offing, and inside the banks generally an hour and upwards before the offing.	Arklow light-vessel.	N.E. by N. S.S.W.	3·6 3·6	N.E. by N. S.W. by S.	3½ 4½	F E
On a line joining Kish light-vessel and Holyhead.	The stream slacks at the Kish upwards of half an hour before the offing, and then bends inwards, towards the bay, setting over Kish bank ; further in shore, it turns 1½ hours before the offing, and 2 hours close in shore.	Kish light-vessel.	N. by E. S.S.W.	2 2	N. by E. S.S.W.	2½ 2½	F E

				Tidal
		Daunt Rock Lt. Ship.*		Coningbeg
Hours.	Direction.		Rate.	Direction.
Before H.W. Liverpool. { 5 4 3 2 1 H.W.	S.S.Ely. S.S.Wly. S.Wly. W.S.Wly. Wly. Wly.		0 to 1 kn. 0 to 1 ,, 0 to 1½ ,, 0 to 2½ ,, 0 to 1 ,, 0 to ½ ,,	East East E. by S. S.E. by E. Sly. W.S.W.
After H.W. Liverpool { 1 2 3 4 5 6	N.N Ely. N.Ely. E.N Ely. E.N.Ely. E.S.Ely. Ely.		0 to ½ ,, 0 to 1 ,, 0 to 1 ,, 0 to 1½ ,, 0 to 1½ ,, 0 to 1 ,,	West West W. by N. W.N.W. N.Wly. E. by N.

* The Wind has so much effect on the direction and rate of the Tidal Streams at Daunt Rk. Lt. Ship, that the above table can only be in the table.
† The direction and rate of the streams at this Lt. Ship are often irregular.

In approaching Holyhead be guarded against the streams which run very strong near the headlands.

At 7 miles off South Stack the stream runs 2½ knots at springs.
At 5 miles　　　ditto　　　ditto　　3 to 3½ knots at springs.
At 2 miles　　　ditto　　　ditto　　5 knots at springs.

The neaps run about two-thirds of these rates. In the channel the direction of the flood is about N.E. by N. and near the Stack N.E. towards the Skerries. Off the Skerries, that is, outside them, the flood turns more easterly, or runs E.N.E., and northward of the Skerries to the eastward.

Off South Stack there is a race occasioned by the meeting of the streams, but increased by some uneven rocky ground off the Stack. It begins about the

Position.	Remarks on the tides near the land.	From	At 5 miles' distance.		½ over.		
				Rate.		Rate.	
On a line joining Calf of Man and the Skerries.	The flood stream meets the Northern stream close to the Calf, and both run along the land to the eastward.	Calf of Man.	Ely. W. by N.	2½ 2½	E. by N. W. by S.	1½ 1½	F E
On a line joining Rockabill and Calf of Man.	From Rockabill to the northward the stream sets fair, taking nearly the direction of the coast, and passes on to St. John point, when it encounters the stream from the North channel ; near here the stream turns to the westward, and bends in, taking the curve of Dundrum bay, which must be guarded against.	Rockabill.	Nly. Sly.	1·0 1½	N.E. S. 1 y W.		F E

of the TIDAL STREAMS in the IRISH CHANNEL.

of the Stream.					Remarks on the tides near the land.	Position.
	½ over.	At 5 miles' distance.		From		
		Rate.		Rate.		
F	N.E.	2½	N.E.	3½ to 4	St. David head.	The stream curves with the land, and the flood sets sharply into Cardigan bay, sweeping more and more in as you near the land.	On a line joining St. David head and Tuskar.
E	S.W.	2½	S.W.	4			
	There is consequently an in-draught into this bay on both ebb and flood.						
F	N.N.E.	3½	N.N.E.	3	Bardsey Island.	The stream curves sharply round Bardsey, and slacks 1h. 20m. in Bardsey sound before it does in	On a line joining Bardsey island and Arklow light-vessel.
E	S.W. by S.	3	S.S.W.	2½			
	the offing, the flood setting strong into Carnarvon, and the ebb strong into Cardigan bay, and vice versâ.						
F	N.N.E.	2½	N. by E.	3½	Holyhead.	In passing Carnarvon bay the stream curves with the bay more and more as you near the bight,	On a line joining Holyhead and Kish light-vessel.
E	S.W by S.	2½	S.W. by S.	3½			
	setting into the bay on one side and out at the other end, near Holyhead bay : the stream sets directly towards the Skerries, sweeping into Holyhead bay when inside a line, joining the North Stack and Skerries, and in the centre of the bay splits, one part setting sharply over the Platters and round Carmel head, the other running towards Fenwick Rock and Penrhyn.						

Streams.				
Lt. Ship.†		Barrels Rock Lt. Ship.		
Rate.		Direction.	Rate.	Hours.
¾ to 1½ kn.		East	2½ to 1½ kn.	5
¼ to 2 ,,		East	1½ to 2½ ,,	4
½ to 1½ ,,		East	½ to 1½ ,,	3
½ to 1½ ,,		E. ½ S.	¾ to 1 ,,	2
0 to ¼ ,,		W'ly.	0 to 1 ,,	1
½ to 1 ,,		W'ly.	½ to 2 ,,	H.W.
½ to 2½ ,,		West	1 to 3 ,,	1
½ to 2½ ,,		West	1½ to 3½ ,,	2
½ to 2 ,,		W. ½ N.	1 to 3 ,,	3
½ to 1½ ,,		W. N. by N.	½ to 8½ ,,	4
0 to ¾ ,,		E'ly.	0 to 1 ,,	5
½ to 1½ ,,		E'ly.	½ to 2½ ,,	6

looked upon as approximate, and the stream may sometimes be found running even in the contrary direction to that given for any hour

first quarter ebb and flood, at first close in with the shore, and gradually increases in strength, extending to seaward in a direction between N.W. and W.S.W. from the lighthouse, according to time of tide ; about the last quarter tide it begins to subside. With strong winds blowing against the tide, the race is heavy, specially about half tide, and even dangerous at that time to small deep laden vessels, so that they should either go outside, or pass between it and the Stack (close to the latter). North and N.W. winds occasion the heaviest sea ; at a distance of 2 miles from the Stack the race is no longer felt, and by keeping the Skerries eastward of N.E. by E. a vessel will pass outside of it. Off North Stack also, there is a race after half-tide, and although not dangerous at any time, it had better be kept clear of in heavy weather, as the sea then breaks short.

of the stream.					Remarks on the tides near the land.	Position.
	½ over.	At 5 miles' distance.		From		
		Rate.		Rate.		
F	E. by N.	2	E. by N.	3	Skerry lighthouse.	From the Skerries the stream sweeps over Coal rock, and runs thence to Lynus and Liverpool in nearly a	On a line joining the Skerries and Calf of Man.
E	W.S.W.	2½	W. by S.	3			
	direct line ; but 20 miles off shore it takes a more northerly direction, and strikes towards the Ribble and Morecambe bay ; near Lynus it curves to the southward, and runs for Priestholm and Great Orme head ; at half-tide the stream slacks in Red bay, turns to the northward, and off Lynus meets the true tide, forming a race.						
F	E. by N.	1½	E.S.E.	2	Calf of Man.	Near the Calf, and to the northward, the flood sets to the southward, and the ebb to the northward ; between	On a line joining Calf of Man and Rockabill.
E	W.S.W.	1½	N.W. by N.	1½			
	the Calf and Rockabill the stream is very slack, being scarcely perceptible midway.						

TIDAL STREAMS IN MENAI STRAIT.

At high water at Holyhead the stream in the eastern entrance is setting out or to the eastward from the Outer road off Penmon point. Whilst from Penmon point to the westward, as far as the west entrance of the strait, the stream is setting to the westward.

At one hour after high water at Holyhead the stream, from about Trecastell point, is setting in the north channels to the eastward, and from Trecastell point to the west entrance the stream is setting to the westward.

At 2 hours after high water at Holyhead the stream is slack at Beaumaris, and thence to the eastward is setting eastward; and to the westward as far as the west entrance of the strait.

At 3 hours after high water at Holyhead the stream at Gallows point is slack, and the line of separation of the streams is there; that is:—from Gallows point to the eastward the stream is setting eastward; whilst from Gallows point to the south-westward the stream is setting to the westward.

At 4 hours after high water at Holyhead the stream is slack off port Penrhyn, and from thence to the north-eastward is setting eastward, whilst from port Penrhyn to the west entrance the stream is setting to the westward.

At 5 hours after high water at Holyhead the stream is slack at or just above Bangor pool, and from thence to the north-east entrance is setting eastward; and is setting westward from there to the west entrance of the strait.

At 6 hours after high water at Holyhead the stream is slack all over the western part of the strait from Menai to the west entrance, whilst from Menai to the east entrance it is still running to the eastward.

At 5 hours before high water at Holyhead the stream in the north-east entrance channels begins to run to the westward as far as Penmon point, whilst from Penmon point to the west entrance the stream is running eastward.

At 4 hours before high water at Holyhead the stream is slack about Trecastell point, and from the east entrance to that point is setting westward ; whilst from the west entrance to that point it is running eastward.

At 3 hours before high water at Holyhead the stream is slack about Beaumaris, from thence to the east entrance is running to the westward, and from Beaumaris to the west entrance to the eastward.

At 2 hours before high water at Holyhead the stream is slack at port Penrhyn, from thence to the east entrance is running to the westward, and from port Penrhyn to the west entrance to the eastward.

At one hour before high water at Holyhead the stream is slack near Bangor pool, from thence to the east entrance is setting to the westward, and from the west entrance to Bangor pool to the eastward.

The above times are subject to acceleration or retardation of about half an hour.

TABLE showing the DIRECTION and RATE (at SPRINGS)

Position.	Remarks on the tides near the land.			Magnetic direction				
		From	At 5 miles distance.	Rate.	½ over.	Rate.		
On a line joining Calf of Man and Walney Island.	Near the Calf and eastward to Langness point, the stream runs strong, and near the land bends to the northward, passing Douglas and Maughold heads, where it is turned to the East and S.E. by the northern stream.	Calf of Man.	E. by N. Wly.	3½ 3½	E. by N. W. by S.	2 2	F E
On a line joining St. John point and Peel (Isle of Man).	The streams from the north and south channels meet off St. John point. Near the land the stream runs 2 knots at springs, but at a distance there is scarcely any tide. On the mouth of lough Strangford, on a south bearing, the outset will be felt at a distance of 3½ miles, sweeping in a curve to the N.E. with the ebb, and to the S.W. with the first of the flood, forming a race: the outset continues to run 2 hours after low water.	St. John point.	S.W. by W. N. Ely.	1½ 1½	S.W. N.E. by N.	Drain	E
On a line joining Peel and Mull of Galloway.	... ...	Peel.	E. by N. Wly.	1 1½	Ely. W. by N.	1½ 1½	F E

Position.	Remarks on the tides near the land.			Magnetic direction				
		From	At 5 miles distance.	Rate.	½ over.	Rate.		
On a line joining Ayre point and Burrow head.	Near Ayre point, in a N.N.W. direction, there is usually a race, especially on the ebb: it takes place upon a bank, which, although shallower than the parts about it, is not dangerous.	Ayre point.	E.S.E. Wly	3½ 3	Ely. Wly.	2½ 3½	F E
On a line joining Ayre point and St. Bees head.	... ...	Ayre point.	S. by E. N.W. by N.	2½ 1½	S. by E. N. Wly.	2½ 2	F E

On the line joining Ayre point and St. Bees head are situated Whitestone and King William banks, which are very dangerous. The tide sets immediately over them in a S.S.E. direction, at a rapid rate, and ought to be carefully guarded against.

The stream sets round Ayre point into Ramsey bay about the time of low water at Liverpool, and sweeps over Bahama bank, and thence passes on

Position.	Remarks on the tides near the land.			Magnetic direction				
		From	At 5 miles distance.	Rate.	½ over.	Rate.		
On a line joining Copeland Island and Mull of Galloway.	... ...	Copeland Island.	S. by E. N. by W.	2 2	S.S.E. N.N.W.	2 2½	F E

TABLE showing the MAGNETIC DIRECTIONS of the TIDAL STREAMS at LIGHT-

Hours.		Lucifer light-vessel.		Blackwater light-vessel.		South Arklow light-vessel.		North Arklow light-vessel.	
		Course.	Rate.	Course.	Rate.	Course.	Rate.	Course.	Rate.
Before H.W. ½Liverpool.	5 4 3 2 1	N.E. by N. N.E. N.E. N.E. S.S.W.* S.S.W. ½ W.	1 to 2½ knots. 1 to 2 ,, 1 to 1½ ,, 0 to 1 ,, ½ to 1 ,, ½ to 1 ,,	N.E. by N. N.E. by N. N.E. by N. N.E. by N. N.E. by N. S.W. by S.	½ to 2½ knots. 1 to 2½ ,, 1 to 2½ ,, 1 to 1½ ,, 0 to 1½ ,, 0 to 1 ,,	N.E. N.E. N.E. N.E. N.E. by E. S.W. by S.	½ to 2½ knots. 1 to 2½ ,, 1 to 3 ,, ½ to 2 ,, 0 to 1 ,, ½ to 1 ,,	N.E. N.E. N.E. N.E. N.E. S.W.	1 to 2½ knots. 1½ to 2½ ,, 1½ to 3½ ,, 1 to 2½ ,, 0 to 1½ ,, 0 to 1½ ,,
H.W.		S.W. ½ S.	1 to 1½ ,,	S.W. by S.	½ to 1½ ,,	S.W.	½ to 2½ ,,	S.W.	½ to 3½ ,,
After H.W. Liverpool.	2 3 4 5 6	S.W. S.W. W.S.W. N.N.E.† N.N.E.	1 to 2½ ,, 1 to 2 ,, 1 to 1½ ,, 0 to 1 ,, ½ to 1½ ,,	S.W. by S. S.W. by S. S.W. by S. S.W. by S. N.E. by N.	½ to 3½ ,, 1 to 3 ,, 1 to 2 ,, 0 to 1 ,, 0 to 1½ ,,	S.W. S.W. S.W. S.W. N.E.	1½ to 3½ ,, 1½ to 3½ ,, 1 to 2½ ,, ½ to 1 ,, 0 to 1 ,,	S.W. S.W. S.W. S.W. N.E.	1½ to 3½ ,, 1½ to 3½ ,, 0 to 1½ ,, 0 to 1½ ,, 0½ to 1½ ,,

* Occasionally N.E., ½ knot.　　　† Occasionally W.S.W., ½ knot.　　　‡ At neaps.

of the TIDAL STREAMS in the IRISH CHANNEL—*continued.*

of the stream.					Remarks on the tides near the land.	Position.
↓ over.	Rate.	At 5 miles distance.	Rate.	From		
F E	E.S.E. N. by N.	1½	S.E. N.W. by W.	2 2	Walney Island.	The stream sets sharply round Walney Island into Morecambe bay.	On a line joining Walney Island and Calf of Man.
F E	S. by E. Slack.	½	Sly. N. by W.	1½ 1½	Peel.	N.W. of Peel the stream divides; one part runs towards the Calf, the other turns to the N.E., passes Contrary head, so called from the set of the tides off it, and runs with an increasing rate along the land to Jurby, and thence to Ayre point.	On a line joining Peel and St. John point.
F E	E. by S. W.N.W.	2¾ 2½	E. by S. W.N.W.	3 0 3½	Mull of Galloway.	Off Mull of Galloway the stream attains its greatest strength, and occasions a race off the head; but there is usually	On a line joining Peel of Galloway and Mull Hole of Man.

a slack very close to the shore, of which steamers who are acquainted take advantage. Between the Mull and Burrow head the stream leads to the northward and finally takes the curve of Luce bay, setting sharply into the bay round the Mull, and out round Burrow head.

of the stream.			Remarks on the tides near the land.						Position.
At 5 miles distance.	Rate.	From							
F E	Ely. W. by N.	¼ ¼	Burrow head.	..	..	..	..	..	..	On a line joining Burrow head and Ayre point.
F E	S. Ely. N.W.	r r	St. Bees head.	Between King William bank and St. Bees head the stream is slack, but near St. Bees head it begins to run, one part passing up the Solway, the other setting towards Walney.					On a line joining St. Bees head and Ayre point.

to Maughold head, where it meets with the tide from the southern channel. At half floodd the stream runs from Bahama bank towards Ramsey, and then turns to the north-west for the rest of the tide.* A few miles eastward of this spot, in latitude 54° 18′ N. and longitude 4° W., the streams from Calf of Man, and that which has passed over Whitestone bank, meet, and thence run directly towards Walney island.

of the stream.			Remarks on the tide near the land.						Position.
At 5 miles distance.	Rate.	From							
F E	S.E. by S. N.N.W.	3 3	Mull of Galloway.	..	..	..	..	..	..	On a line joining Mull of Galloway and Copeland island.

VESSELS in the IRISH CHANNEL, between latitudes 52° 20′ N., and 53° 20′ N.

Hours.	Codling bank light-vessel.		Kish bank light-vessel.		‡ Cardigan Bay light-vessel.		Carnarvon Bay light-vessel.	
	Course.	Rate.	Course.	Rate.	Course.	Rate.	Course.	Rate.
Before H.W. Liver-pool. { 5 4 3 2 1	N.E. N.E. N.E. N.E. ¼ E.	1, to 2½ knots. 1¼ to 2½ „ 1¼ to 1¾ „ 1 to 1¼ „ Slack.	N.N.E. N.N.E. N.N.E. N.N.E. N.N.E.	1 to 1½ knots. ½ to 2 „ 1 to 2½ „ 1 to 1½ „ 0 to 1 „	N.E. by N. N.E. by N. N.E. by N. N.E. by N. N.E. by N.	1 to 2½ knots. 1 to 2½ „ 1 to 2 „ 1 to 2 „ 1 to 1 „	N.N.E. N.N.E. N.N.E. N.N.E. :S.S.W.or N.N.E.	½ to 1½ knots. 1 to 2 „ 1 to 2¼ „ 1 to 2 „ 1 to 1 „
H.W.	S.W.½ S.	1 to 2½ „	S.S.W.	0 to 1½ „	S. outherly	0 to 1 „	0 to 1 „	0 to 1 „
After H.W. Liver-pool. { 1 2 3 4 5 6	S.W. S.W. S.W. S.W. ¼ W. N.E. ½ N.	1½ to 3 „ 1¼ to 3 „ 2 to 2¼ „ 1 to 1½ Slack. ½ to 2 „	S.S.W. S.S.W. S.N.W. S.S.W. S.S.W. N.N.E.	1 to 2½ „ 1 to 2 „ 1 to 2 „ ½ to 1½ „ 0 to 1 „ 0 to 1 „	S.W. by S. S.W.½ S. S.W. S.W. S.W. by S. N.E. by N.	1 to 1 „ 1 to 2½ „ 1 to 2 „ 2 to ½ „ 0 to 1 „	S.S.W. S.S.W. S.S.W. S.S.W. :N.N.E.or S.S.W.	1 to 1 „ 1 to 2 „ 1 to 1½ „ 1 to 1 „ 0 to 1 ½

‡ The direction of the streams is affected by the wind. * See Bahama light-vessel. ‡ Direction of stream at these times depends on direction and force of wind.

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TABLE showing the DIRECTION and RATE (at SPRINGS)

Copeland islands and Belfast lough.

The main body of the stream, ebb, and flood, crosses the entrance of this lough in a curve from the Copeland islands to Black head, and near the islands gains a strength of 5 knots; this curve bends more and more in until it stretches from White head to Grey point, when it divides, one part of the flood running up to Garmoyle, the other bending back and running towards Orlock, and near that place will carry a vessel upon the Briggs, if not guarded against.

The first of the flood sets through Copeland sound and between the islands at a rapid rate, and care must be taken not to be swept into the intricate passage between Copeland islands. At half-tide, all the inshore part of the tide within $1\frac{1}{2}$ miles of the coast south of Copeland islands slacks, and shortly turns to the northward and runs for 3 hours, whilst the stream in the offing is still going to the southward; so that between Ballyferris and Foreland points, quite close in, the stream runs 9 hours to the northward, and only 3 to the southward.

Position.	Remarks on the tides near the land.	Magnetic direction.					
		From	At 5 miles distance.		¼ over.		
				Rate.		Rate.	
On a line joining Corsewall point and Sanda island.	Near Corsewall point the stream gains strength, and close in takes the curve of the land, the flood setting to the S.W. round the lighthouse, and the ebb vice versa.	Corsewall point.	S. by E. N.W. by N.	1¼ 1¼	S.E. N.W.	1¼ 1¼	F E
On a line joining Muck island and Corsewall point.	Close to Muck island the stream attains great strength, the flood turning round Black head into the Belfast lough, but at a few miles off shore it runs straight towards Copeland islands.	Muck island.	S.S.E. N.N.W.	1¼ 1¼	S.S.E. N.N.W.	1¼ 1¼	F E

The tides off Muck island run from $3\frac{1}{2}$ to $4\frac{1}{2}$ knots close in, and occasion a race and heavy breaking sea at springs; and in blowing weather there are races also off both Black head and White head, and also the Gobbins; with the *ebb tide* there is an eddy from half tide, close in shore, which may be taken advantage of by steam vessels at all times, and by sailing vessels with a leading wind; but it does not extend sufficiently far off for sailing vessels to benefit by it with a working wind, as they would be in danger of getting on the rocks if they missed stays.

Position.	Remarks on the tides near the land.	Magnetic direction of the stream.					
		From	¼ over.		¾ over.		
				Rate.		Rate.	
On a line joining Tor point and Mull of Cantyre.	Close off Tor point the flood runs upwards of four knots at Springs.	Tor point.	S.S.E. N.N.W.	4 3¼	S.S.E. N.N.W.	4 3¼	E F

Hours.		Tidal Streams at light-vessels off north-east coast of Ireland.				Tidal Streams at light-vessels eastward of Isle of Man.			
		Skulmartin light-vessel.		South Rock light-vessel.		Morecambe Bay light-vessel.		Bahama Bank light-vessel.*	
		Direction.	Rate.	Direction.	Rate.	Direction.	Rate.	Direction.	Rate.
Before H.W. Liver-pool.	5 4 3 2 1	South South South South South	¼ to 2¼ knots. 1 to 2 " 1 to 1½ " ½ to 1½ " 0 to ½ "	S.S.W. S.S.W. S.S.W. S.S.W. S'ly. or N'ly.	¼ to 1½ knots. ½ to 1½ " 1 to 1½ " ½ to 1 " 0 to ½ "	S.E. by E. ½ E E.S.E. E.S.E. E.S.E. E.S.E.	½ to 1 knots. 1 to 2 " 1 to 2 " ½ to 2 " 1 to 1½ "	S.S.E. S.S.E. S.S.E. S.Wly S.Wly	½ to 1 knots. ½ to 1 " ½ to 1 " 0 to ½ " 0 to ½ "
H.W.	1	North	½ to 1½ "	S.N.E'ly.	0 to 1 "	N. E'ly.	0 to ½ "	N.N.W.	½ to 1½ "
		North	½ to 2½ "	N.N.E.	¼ to 1½ "	W.N.W.	½ to 1½ "	N.N.W.	½ to 1½ "
After H.W. Liver-pool.	2 3 4 5 6	North North North North South	1 to 2½ " 1 to 1½ " ½ to 1½ " 0 to ¾ " 1 to 1½ "	N.N.E. N.N.E. N.E. N.E. N'ly. or S'ly. S'ly.	½ to 1½ " ½ to 1½ " ¼ to 1 " ½ to 1 " 0 to ½ " ½ to 1 "	W.N.W. W.N.W. W.N.W. W.N.W. W. by N.	1 to 2 " ½ to 1½ " ½ to 1½ " ¼ to 1½ " ¼ to 1 "	N.N.W. N.N.W. N.N.W. N.N.W. S.S.E.	½ to 1½ " ½ to 1 " ½ to 1 " 0 to ½ " 0 to ½ "

The directions and rates of the streams are much influenced by the wind.
* The rate of the streams at the Bahama Bank light-vessel is much affected by the wind.

of the TIDAL STREAMS in the IRISH CHANNEL—*continued.*

The 3rd quarter of the flood having turned to the northward, meets the tide through the sound off Deputy reef, and they jointly strike off for the south end of Copeland islands and pass over the Bushes, and thence through the channel between the islands.

The eddy under Mew island at this time rushes with great speed to the N.E. until it meets the true tide, and with it forms a race which sailing vessels should avoid; on the ebb a similar race occurs, but to the N.E. of Mew island.

The last of the flood sets to the northward through the sound, and splits off the south end of Copeland islands, and one part makes towards Mew island, throwing off branches between the islands.

Around Copeland islands the eddies are very strong, and at night a vessel should be sure that she is outside the drift of the point off Mew island.

of the stream.				Remarks on the tides near the land.	Position.
At 5 miles distance.			From		
F E	E. by S. W.N.W.	2 1½	Sanda Island.	The tide runs fast past Sanda Island, and is variable in its direction. Off the western end of the island it splits; the outer part passing on for the Clyde, and the other setting inside the island, and up Kilbrennen sound, as mentioned below.	On a line joining Sanda Island and Corsewall point.
F E	S. by E. N. by W.	1½ 1½	Corsewall point.	.. ..	On a line joining Corsewall point and Muck Island.

After passing White head, the tide slacks considerably as you enter the lough: With the *flood* there is a strong eddy under Muck island, which will be found very useful to steam vessels, and even sailing vessels, beating along this coast; with a northerly wind they will do well to keep close in with the shore hereabout, as the strength of the flood strikes off from Muck island in a S.E. direction, till it meets the stream which passes the eastern side of the Maidens, when it takes a channel direction; the meeting of these two tides appear to have occasioned a deep ditch in which will be found from 90 to 100 fathoms water.

Remarks on tides near the land.	Position.
Near Mull of Cantyre the stream runs 5 knots, and occasions a heavy dangerous sea in bad weather; with either tide, quite close in, there is an eddy. From the Mull of Cantyre the flood takes a direction nearly for Sanda Island, and divides off its western end: one part passing inside the island and up Kilbrennen sound, the other setting towards the Clyde.	On a line joining Mull of Cantyre and Tor point.

Tidal Streams at Selker light-vessel.*		Tidal Streams at Solway light-vessel.		Tidal Streams at light-vessels in Liverpool approach.			
				N.W. light-vessel.		Bar light-vessel.	
Direction.	Rate.	Direction.	Rate.	Direction.	Rate.	Direction.	Rate.
S. by E.	½ to 1½ knots.	S.W.	0 to 1½ knots.	E.S.E.	½ to 1 knots.	S.E. by E.	½ to 1½ knots.
S.S.E.	½ to 1½ „	N.E.	½ to 2 „	E.S.E.	½ to 1½ „	S.E. by E.	½ to 2½ „
S.Ely.	½ to 1 „	N.E.	1 to 3 „	E.S.E.	1 to 2 „	S.E.	1 to 2½ „
E.S.Ely.	0 to ½ „	N.E.	1 to 4½ „	E.S.E.	1 to 1½ „	S.E.	½ to 2½ „
Nly.	0 to ½ „	N.E.	1 to 4½ „	E.S.E.	½ to 1½ „	S.E.	½ to 2 „
Nly.	½ to 1 „	N.E.	½ to 2½ „		Slack	S.S.E.	0 to 1 „
N. by W.	½ to 1½ „	N.E.	0 to 2½ „	W.N.W.	½ to 1½ „	N.W.	½ to 1½ „
N.N.W.	½ to 1½ „	S.W.	½ to 2 „	W.N.W.	1 to 1½ „	N.W.	½ to 2 „
N.N.W.	½ to 1 „	S.W.	1 to 3½ „	W.N.W.	1 to 2 „	N.W.	½ to 1 „
N.Wly.	0 to 1 „	S.W.	1 to 4 „	W.N.W.	1 to 1½ „	N.W.	½ to 1½ „
Sly.	0 to 1 „	S.W.	1 to 4 „	W.N.W.	1 to 1½ „	N.W.	½ to 2½ „
S. by E.	½ to 1½ „	S.W.	1 to 3 „	W.N.W.	0 to ½ „	N.W.	0 to 1 „

* The direction and rate of the streams at this light-vessel are very much affected by the wind and the results given are only approximate.

TIDES AND TIDAL STREAMS ON THE WEST COAST OF SCOTLAND.

By Archibald Smith, M.A., F.R.S.

The tidal streams on that part of the west coast of Scotland which is comprised between the Mull of Cantyre and the island of Mull run in general with great velocity. Their velocity, direction, and the time of their change, or of slack water, are therefore matters of importance to navigators. On the other hand, the rise and fall of the tide is so small, and the depth of the water in the channels and the harbours so considerable, that the times of high and low water are of comparatively small importance.

While the laws of the streams are thus of more importance than the laws of the rise and fall of the tide, they are also much more simple. The times of high and low water are very different at different parts of the coast, while the times of slack water are nearly the same throughout the whole region in question. In a great part of this region the stream has no distinct title to be considered either a flood or an ebb stream although at any point it generally flows for six hours in one direction, and for six hours in the opposite direction.

The time of high and low water in the region which we are considering may be thus described. Near the two extremities, viz. : the Giant's Causeway and the island of Easdale, the time of high water at full and change is nearly $5\frac{1}{2}$h. (*Greenwich time*), being very nearly that due to the Atlantic tidal undulation propagated from S.W. to N.E., and the same is very nearly the hour of high water on the chain of islands of which Islay, Jura, and Scarba are the chief. But along the coast of the mainland of Scotland and north coast of Ireland the case is very different. Between these two countries is the great opening into the Liverpool basin, in which it is high water about 11h. The change in the time of high water takes place by the following gradations :— At Giant's Causeway it is high water full and change about 6h. ; at Ballycastle 7h. ; Tor point 10h. ; Mull of Cantyre 11h. ; Gigha 2h. ; loch Killisport 4h. ; Easdale and Scarba 5h. : Jura and Islay $5\frac{1}{2}$h. But while the hour of high water varies, the stream through nearly the whole of the region runs towards Liverpool when the tide is rising there, and away from it when the tide is falling there.

Between the Mull of Cantyre and the north-east coast of Ireland, the most westerly part of the north-going stream turns to the west, and runs through the sound of Rathlin along the north coast of Ireland ; the central part flows to the north-west past the Rhynns of Islay ; the easterly part, which has flowed partly through the sound of Sanda, turns sharply round the Mull of Cantyre, and flows to the northward, pouring with great velocity through the narrow openings in the chain of islands, viz. : the sound of Islay, between Islay and Jura, the gulf of Coirebhreacain between Jura and Scarba, the little Coirebhreacain between Scarba and Lunga, the Slate isles and Cuan sound ; of these, the little Coirebhreacain is quite impassable ; and Coirebhreacain and Cuan sound are seldom attempted except near slack water.

These channels open into the basin which lies between Jura and Iona—a comparatively streamless sea, owing apparently to the circumstances of the ocean undulation from the outside of Islay rising to nearly the same height as that which pours through the openings, so that the tidal stream would be little altered by building a dam from Islay to the Ross of Mull.

Great complication arises from describing the time of change of the stream by reference to the time of high and low water on the shore; thus we should have to say that in the sound of Sanda, the ebb stream begins two hours before high water; at the Mull of Cantyre, one hour before high water; a little north of this, again two hours before high water. Southward of Gigha, we might say indifferently that the flood tide runs to the south and begins three hours before low water, or that it runs to the north and begins three hours after low water; in the sound of Islay and in the gulf of Coirebhreacain that it begins an hour before low water; and in describing the streams along the north coast of Ireland we have even greater complication.

The direction of the tidal streams on the rest of the West coast of Scotland is easily described. Proceeding northward the times of the turn of the streams is gradually retarded, thus through the sound of Mull the streams change half an hour after high and low water at Liverpool, whilst outside of Skye they change at one hour after high and low water at Liverpool.

Round the north end of the island of Lewis, the stream bends into the Minch and meets the stream from the southward, the course of both streams being nearly the same as if there were an embankment from loch Shell in the island of Lewis to Ru Rea on the coast of Ross-shire. At the same time, another branch of the stream which has rounded Ardnamurchan point flows through Sleat sound, and being an hour earlier than the tide which has rounded the north end of Skye, it pours with great velocity through Kyle Rea, but owing to the undulations ·round Skye meeting near Kyle Akin there is very little stream through that narrow opening; the flood stream, as it is stated, sometimes flowing in one direction and sometimes in the other, according to the prevailing winds.

THE TIDES AND TIDAL STREAMS AMONG THE ORKNEY ISLANDS.

By Captain F. W. L. Thomas, R.N.

The great rapidity of the tidal streams in the vicinity of the Orkney islands makes a correct knowledge of their periods and velocities of the utmost importance to the mariner. *General remarks.*

In the terrific gales which usually occur four or five times in every year, all distinction between air and water is lost, the nearest objects are obscured by spray, and everything seems enveloped in a thick smoke; upon the open coast the sea striking upon the rocky shores, rises in foam for several hundred feet, and spreads over the whole country.

The sea, however, is not so heavy in the violent gales of short continuance as when an ordinary gale has been blowing for many days; the whole force of the Atlantic is then beating against the Orcadian shores, rocks of many tons in weight are lifted from their beds, and the roar of the surge may be heard for twenty miles; the breakers rise to the height of sixty feet, and the broken sea on the North shoal, which lies 12 miles N.W. of Costa head, is visible even at Skail and Birsay.

Similar effects may be witnessed in any stormy region, but here they are increased by the power of the tidal stream, and when the whole mass of water is in motion, a very slight inequality at the bottom of the sea is indicated by a ripple on the surface, so that by these means shoaler spots have been detected (to the eastward of *Depth of the* North Ronaldsay) at a depth of 47 fathoms, though the difference *tidal stream.* in depth was but 20 feet. On the rocky bank of the North shoal, which is about 4 miles in length, the ripple distinguishes any inequality of 10 or 15 feet, at a depth of 30 fathoms, even when the stream is moving but one mile per hour. It is only in calm or very fine weather that these ripplings can be observed, but when the wind increases upon a weather tide the sea will break over every inequality of the sea bottom. These broken seas are danger-ous, and during the survey of these islands great peril was some-times incurred by moving the ship before sufficient time had elapsed for the sea to become quiet.

High water at The tidal undulation from the N.W. makes high water on *Stromness,* the whole west coast of the Orkneys at nearly the same time; *Pierowall.* the establishment for Stromness being 9 o'clock and that for Pierowall in Westray, about 6 minutes later. At the north-east end of the Orkneys it is but a few minutes later than at the *Otters Wick.* north-west, as the establishment for Otters Wick is 9h. 13m.; but the undulation there is probably retarded by having to pass over the shoal water at the mouth of the bay.

Holm sound. On the south-east side of the Orkneys, in Holm sound, it is high water about 9h. 35m.

The vulgar establishment, or time of high water, full and new moon, varies greatly; the mean of nine observations at Otters Wick gives 9h. 13m., but they vary between 8h. 58m. and 9h. 42m.

When the tide has to pass through a narrow or shallow channel, the retardation is very great; thus it is high water an hour earlier at the mouth of Eynhallow sound than at Kirkwall, though the distance is but 11 miles; and by levelling across Sanday (about *Difference* half a mile), it appeared than when it was high water at Otters *sea-level.* Wick, the sea-level was 4 feet 8 inches above the sea-level of Gatasand, and that high water was 1h. 43m. later at Gatasand than at Otters Wick.

Mean range of The mean range of tide at springs in the North isles of the *North isles.* Orkneys is 11 feet 2 inches, and at neaps 5 feet.

Extraordinary springs may be 3 feet 4 inches above or below *Diurnal* the mean; there is considerable diurnal inequality; for in some *inequality.* instances the difference in the rise of two consecutive tides has been observed to amount to 2 feet 10 inches.

South isles. In the South isles the mean range at springs is about 1 foot less than in the North, being 10 feet; at neaps 5 feet.

Set of stream, The passage from the westward round the north end of the *Mull of Papa.* Orkneys is rendered somewhat treacherous by the peculiar set of

the stream; for the body of the east-going stream coming from the north-west, a ship must be 6 or 7 miles to the northward of the Mull of Papa to drift clear of North Ronaldsay. The first half of this stream sets from the Mull straight from North Ronaldsay (E.S.E.), and should the wind fail while it is running, there would be a great probability of drifting ashore. *From Mull of Papa to North Ronaldsay.*

The east-going stream passes slowly the north coast of Westray (sending a weak offset between Papa and Aikerness), and joins the main stream off Mull head, where a bore or *röst** is formed, which stretches several miles to sea. The strength of the stream is here about 6 knots per hour; between Papa and North Ronaldsay 3 knots; but near North Ronaldsay the rate again increases to 6 knots, passing over the Altars of Linnay and Seal Skerry with great violence. The stream splits on the west coast of North Ronaldsay with the Established kirk (the southernmost) in one with a small byre; and should a vessel be drifting down on the island, she should endeavour to pass to the southward, when she will go clear of everything. *Bore off Papa rate of stream.* *North Ronaldsay.*

Off Seal Skerry there is a bad röst with southerly winds, and the stream runs 6 knots an hour between that point and Dennis head; it does not, however, touch the shore, but leaves a small eddy or countertide, where boats can turn up as far as the Skerry. *Seal Skerry röst.*

The stream sets strongly between Fair isle and the Orkneys. For on one occasion having Dennis head bearing S. by E. distant 8 miles, the south-east-going stream having set S.E. by S. for three hours, and, being then high water on the shore, it shifted its direction $3\frac{1}{4}$ points; that is, it set South for the next three hours, or until it was half-ebb on the shore, its greatest rate having been 3 to 4 knots per hour. An hour before this, the vessel's track began to take a curved form, which continued to grow sharper as the rate of the stream decreased, so that without any stopping, we found ourselves drifting with the north - west - going stream North, and parallel to, but at the distance of 2 miles from, our former track. The stream continued steadily North for four hours, running 2·8 knots an hour at its strength, after which it began to curve to the eastward, thus appearing to describe a long oval, and revolving in the direction of the hands of a watch. *Tidal streams between Fair isle and the Orkneys.*

It also appears that when it is half flood on the shore, it is slack water in the stream; that when it is high or low water on the shore the stream is running strongest. The stream therefore is slack, or nearly so, at high water at Wick, which is almost the same time as high water at Dover, and is running south-east while the tide is rising at Wick, and north-west when falling there. *Tide and half tide.*

These observations will show how little dependence can be placed upon a direct course among these treacherous streams; and those who have been beating about for some days against a head wind are particularly exposed to this danger. It is a common remark with the people of North Ronaldsay, that all vessels come ashore with the south-east-going streams.

The south - east - going stream from Runabrake sets into North Ronaldsay firth at the rate of 3 knots per hour; from the Holms *North Ronaldsay firth.*

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* Röst (pronounced reust) a Scandinavian word, meaning a roaring, broken, tidal sea.

of Ire it sets over the Baa of Trevan, and both streams passing
through the firth at the rate of 4 knots, continue to run two hours
after high water on the shore.

Start of
Sanday.
Rost.
Off the Start the first of the south-east-going stream sets to the
southward, but changes, as it grows older, to S.W. There is an
extremely bad rost off the Start with southerly winds and opposing
tide, stretching 3 or 4 miles to sea, but being heaviest near the
shore.

Calf and Lashy
sounds.
Between Westray and Sanday the stream is scarcely sensible,
but gathering strength as it approaches Calf sound and Lashy
sound, it rushes through those narrow passes at the rate of 6 knots
an hour, decreasing to 2 or 3 knots in Eday sound, where the
stream falls into the Stronsay firth. In those sounds the stream
runs 1½ hours after it is high water on the shore.

Spurness
sound.
In Spurness sound the stream turns to the eastward half-an-hour
before it is low water on the shore, or 1¾ hours before the general
turn of the stream, and turns every six hours. This stream is
like a mill race in the narrows when passing Spur ness, but it
speedily becomes diffused in Sanday sound and off Kettletoft it
scarcely runs 2 knots.

Stronsay and
Westray
firths.
In the Stronsay and Westray firths, which form one continuous
and nearly straight channel, the stream is very rapid, as through
them and Eynhallow sound the body of the ocean tide is dis-
charged. In Westray firth the south-east-going stream begins
2 hours after low water by the shore, or when it is low water at
Wick, and runs 6 hours.

North shoal.
At the North shoal, which is 15 miles from the entrance of the
firth, the tide stream sets E. by S. (towards the entrance), and at
springs runs about one mile an hour.

Brough of
Birsay.
Along the west coast of Mainland, the stream is only
sensible off the points; but off the Brough of Birsay the
stream sets to the northward from four hours before until two
hours after it is high water on the shore, when its greatest rate is
2 knots.

West Coast of
Rousay.
From the Brough of Birsay this stream sets along shore for
Costa and Sacquoy heads, increasing in velocity as it approaches
the Westray firth. The influence of the indraught through
Eynhallow sound is scarcely felt beyond a line joining Costa head
and Quoynalonga head.

Skea Skerries.
The stream runs south along the west coast of Westray, from
the Noup to Berstness, and over the Skea Skerries from 4 hours
before until 2 hours after high water. Between them and Rousay
it acquires great force, even 6 knots an hour. Its chief weight
Kili holm.
War ness.
passes close round Kili holm, and crosses for War ness (the South
point of Eday) and the Greenholms.

At War ness the stream runs 7 knots per hour, and the rost is
quite impassable during southerly gales and the opposing spring
stream. At that time the sound between the Ork ness, Shapinsay,
and War ness is in violent commotion, and when bound to
Stronsay firth. Stronsay, a line of breakers may sometimes be seen roaring and
foaming within half a cable's length, while vainly looking for a
gap or smooth.

The main stream from War ness, joined by the stream from Eday
sound, sets past Roithisholm head, and clear of Auskerry to the
open sea; and from the Greenholms, past Shapinsay and Deerness,

where it is joined by the String, the usual name for the direct run of the stream from Eynhallow sound by Gairsay, Helliar Holm, and Deerness.   Its rate between Shapinsay and Roithisholm is 6 knots, and between the Mull of Deerness and Auskerry about 4 knots.

In Weatherness and Fara sounds the stream turns to the east- *Weatherness* ward as soon as the tide has ceased to fall upon the shore; that is, *and Fara* it makes 2½ hours before it does in Westray firth.   The stream *sounds.* pours through the narrows of Weatherness and Fara sounds at the rate of 4 knots, and then sets very weakly towards Calf sound.

A very weak stream runs south through Howe sound during the *Egilsay and* rising tide, and it is also weak on the east side of Egilsay; for the *Shapinsay.* body of the stream goes transversely across the channel, and leaves comparatively still water along Egilsay and the north side of Shapinsay.

The stream from Costa and Quoynalonga heads runs towards *Sound.* Eynhallow, and divides there, passing Burgar röst and the Weal race at the rate of 7 knots; the streams unite when past the island, but do not average more than 4 knots down Eynhallow sound.

A very weak stream passes eastwards through Viera sound, and *Viera sound.* another south of Viera island; but off Sewyn holm, where the *Sewyn holm.* latter stream unites with that from the Westray firth, the rate scarcely equals 2 knots.   In the narrow channels among the group of Holms between Gairsay and Shapinsay, it sets southerly 6 knots with the rising tide.

The main stream from Eynhallow sound passes south of Gairsay *Between* and thence transversely to Twi ness, and on through Shapinsay *Gairsay and* sound, and is narrow in its passage between Work head and *Shapinsay,* Helliar holm, nor does the String expand for some distance *and by Work* after passing that place; the rate at springs is about 3 knots, and *head.* the stream does not turn to the north-west till 1¼ hours after high water on the shore.

The stream running through Hoy sound commences on the *Hoy sound.* North side at the Millstone quarry, 4 miles from Hoy mouth, and on the South from St. John head; the indraught is scarcely felt 5 miles outside the entrance.

In Hoy mouth the rate of the stream is 4 knots, until it divides upon Graemsay, when the rate increases to 6 knots; one stream passing through Burra sound, the other between Graemsay and *Burra sound.* Stromness.   The stream goes over the Skerry of Ness, and from thence sets fair for the Skerries of Clestron, where it divides, one part running into the bay of Irland, and at half flood setting as a back-tide out of Cairston road; the other setting rather off shore at first, and then towards Houton head.   From Burra sound *Houton head.* the stream sets along the coast of Hoy to Green head, the rate being scarcely 3 knots an hour; and Graemsay causes a large area of slack water in the middle of the sound.   After passing Houton head, the east-going stream becomes diffused in Scapa flow, and *Scapa flow.* is only sensible off that point; its general direction is towards Holm sound, and at the Barrel of Butter it scarcely runs 2 knots an hour at springs.

TIDES IN THE PENTLAND FIRTH.

By Staff Commander T. H. Tizard, R.N., 1885.

General tidal phenomena. ALTHOUGH the actual times of high and low water in different parts of Pentland firth vary considerably, ranging over a period of upwards of 2 hours, the turning of the tidal stream is practically simultaneous throughout and coincides with the time of high and low water at Wick; that is, the stream in the main body of the firth will always be found running from the Atlantic towards the North sea whilst the tide is rising at Wick, and from the North sea to the Atlantic whilst the tide is falling at that place. Wick is therefore the standard port of reference for the tidal streams of the firth, and to that port they have been in the following account referred, as any other arrangement would be not only confusing but possibly misleading.

A constant is given in the Admiralty Tide Tables, at page 103, from which the time of high water at Wick can be inferred from that at Leith (a standard port).

Change of stream. The change of stream in the main body of the firth coincides practically with the times of high and low water at Wick, for although the actual moment of change may be a little earlier or later, or may be influenced in a small degree, especially at neaps, by the wind, yet slack water will be found at those times in nearly all parts of the firth, except close in shore; there the stream is accelerated or retarded. Thus off Dunnet head the stream changes at $1\frac{1}{2}$ hours before high and low water at Wick; off Duncansby head the east-going stream continues running for nearly an hour after high water at Wick; between Pentland Skerries and South Ronaldsay, although it begins at low water at Wick, the west-going stream commences half an hour before high water at that place, and continues running off Brims ness for three quarters of an hour after low water at Wick, though off Torr ness it changes at high and low water at Wick. In the Outer sound, the change of stream is at half an hour before high and low water at Wick, but midway between Dunnet head and Tor ness, the west-going stream continues running until one or $1\frac{1}{2}$ hours after low water at Wick.

Velocity, direction, and turbulence. The velocity and turbulence of the tidal stream in the Firth is greater than in any other part of the British islands, so that in a strong gale with an opposing stream, the sea is in places impassable, and even after the wind has subsided continues to break with violence for some days. The sea, however, is not so heavy in the violent local gales of short duration, as when an ordinary gale has prevailed for some days. With westerly gales, the worst sea will be found nearly on a line joining St. Johns point with Tor ness; with easterly or south-easterly gales, it is roughest in the eastern part of the firth, and comparatively smooth water prevails on the lee side of the breaking sea.

The great velocity of the stream in the firth arises from the opposition of the Orkneys to the tidal wave from the Atlantic, so that a considerable portion of the stream is deflected southward along the West coast of Hoy towards the Caithness shore. The stream thus deflected rushes through the Pentland firth, and attains in many places a rate of 7 to 8 knots an hour; at the South end of Swona and North end of Stroma it increases to 9 knots, and close to Little Skerry exceeds 10 knots. At Great Skerry and

Lother reef, both of which offer considerable resistance to the stream, the water is sensibly higher on the stream side, and a small rapid is formed, of little height indeed, but of great power. Vessels drifted on the Lother reef, when covered by the tide, have rolled over that danger and sunk in deep water.

On the North side of the firth, the East-going stream com- *Streams on* mences at low water at Wick, but does not turn off Brims ness *Orkney shore.* until three-quarters of an hour after.   About 1½ hours after low water, the stream runs rapidly along the coast of South Walls towards Herston head (decreasing in strength as that promontory is approached), one part turning to the northward into Scapa Flow, and the other to the southward towards Barth head, after passing which its rapidity is again increased, and it bends round Lother reef and to the eastward between South Ronaldsay and Pentland Skerries.   At about half flood at Wick, the stream from Brims ness towards Cantick head slackens close inshore and there is a narrow eddy, but from one to 2 miles South of Brims ness the stream continues to flow in an E.S.E. direction towards Swona until high water at Wick.

Between Cantick head and Swona, the general direction of the East-going stream is towards South Ronaldsay and southward between it and Swona, but it is almost impossible to predict exactly what direction a drifting vessel will take ; with Barth head open North of Swona, the first quarter would send her North of that island and in the mid-channel between it and South Ronaldsay, but the half stream would take her too close to Barth head and perhaps drift her on Lother reef.

From Widewall, the first of the East-going stream sets towards Barth head and Lother reef, so that in light winds, vessels using the northern channel should pass close to the North end of Swona. As a general rule, if a vessel leaving Widewall with light winds and an east-going stream should drift nearer Swona than Barth head, she will probably clear Lother reef ; if nearer Barth head, she will pass too close to that danger.

When the East-going stream at the North end of Swona begins, its direction is first across the channel, but it gradually turns to the southward, passing clear of Lother reef and to the northward of Pentland Skerries ; but after half flood at Wick, it passes westward of the Skerries, and consequently, at a certain period of the tide, sets towards them.

Between South Ronaldsay and the Skerries, the first of the *Liddel eddy.* East-going stream sets fairly out to sea with a velocity of 7 knots, but after 2 hours flood at Wick, a South-going stream com- mences along the East coast of South Ronaldsay, which forces the stream from the firth to the southward, and forms an eddy between its northern edge and the south coast of South Ronaldsay.   This, the Liddel eddy, increases in size as the South-going stream grows older, so that at 3 hours flood at Wick, it occupies half the space between South Ronaldsay and Great Skerry ; at 4 hours flood, three-fourths of that space ; and just before high water, only a drain of the tide will be found passing immediately North of Great Skerry.

The West-going stream on the Orkney shore commences off Old head at about half an hour before high water at Wick, and runs fairly through the channel between South Ronaldsay and Great Skerry ; the northern half bending to the northward round the north point of Swona towards Cantick head, and then along the

coast round Tor ness; whilst the southern half passes South of Swona towards Brims ness, off which it meets the northern part; between them they enclose the Swona ebb eddy. The mid-channel stream between Great Skerry and South Ronaldsay runs straight towards Swona South Cletta. The last part of the stream passing Tarf tail circles round Swona ebb eddy, and returns North of Swona with the first of the East-going stream.

Streams on the Caithness shore. The East-going stream on the Caithness shore commences off Dunnet head at $1\frac{1}{2}$ hours before low water at Wick, and sets parallel with the land into Brough bay and along shore towards St. Johns point and from that point towards Stroma island, so that a buoy set adrift within half a mile of Mey bay will not be set through the Inner sound, but drift on shore on Stroma. Farther North off Dunnet head the stream sets E.S.E. straight for Stroma, and to make certain of drifting clear of that island, the Pentland Skerries should be open North of Swilkie point.

In the Inner sound the East-going stream is very narrow, and both shores have slacks shortly after half flood at Wick, although the stream in the centre continues until high water at that place. As the East-going stream commences off Dunnet head at $1\frac{1}{2}$ hours before low water at Wick, and continues running off Duncansby head until one hour after high water, it is evident the Caithness is the preferable shore for vessels bound eastward.

The West-going stream through the Inner sound is only felt close in towards the Caithness shore, for a buoy set adrift a little distance eastward of Duncansby head will be set round the north end of Stroma and thence towards Tor ness.

Streams in the outer sound. In mid-channel between Tor ness and Dunnet head, the East-going stream does not attain any considerable velocity or commence until $1\frac{1}{2}$ hours after low water at Wick—a difference of 3 hours in the turning of the stream between the Caithness shore and mid-channel, and of $1\frac{1}{2}$ hours at Tor ness.

The East-going stream in the western part of the firth has a steady E.S.E. direction at all times, and a vessel should have Brough ness open of Tarf tail and Great Skerry open of Swilkie point, to ensure drifting between Swona and Stroma. As the Outer sound is approached, the velocity of the stream increases, and its direction after passing through the Outer sound is S.S.E. between Pentland Skerries and Duncansby head, excepting at the early part, when a small portion passes northward of or between the Skerries.

The West-going stream in the eastern part of the firth—like the east going in the western—does not attain any great velocity, and as it commences between the Skerries and South Ronaldsay $1\frac{1}{2}$ hours before it does at Duncansby head, and continues running in the central part of the firth between Tor ness and Dunnet head until $1\frac{1}{2}$ hours after high water at Wick, the most advantageous route for vessels bound westward is to enter the firth between South Ronaldsay and the Skerries and pass through the Outer sound. To ensure passing between Swona and Stroma, Dunnet head must be kept well shut in behind Swilkie point.

The indraught of the West-going stream is felt at a considerable distance from the entrance, so that vessels leaving the Mull of Deerness in calm weather are sometimes drifted into the Pentland firth. From Copinsay the stream runs 9 hours to the southward, that is, from 2 hours flood at Wick to one hour before low water at that place, but its rate, excepting near Old head, seldom exceeds 2 knots,

When the West-going stream has made strong, it sets fairly through between the Skerries and Duncansby head, and between Stroma and Swona until it meets the stream from the Inner sound, the two enclosing a large eddy known as Stroma ebb eddy. At half ebb at Wick, these united streams set over towards Tor ness.

There are four races on the East-going stream, viz., the West bore *Races.* of Huna ; Duncansby bore ; the Swilkie ; and the north edge of Swona flood eddy.

There are two races on the West-going stream—the Merry Men of Mey ; and the Swilkie.

There are seven eddies on the East-going stream—in Brough bay ; *Eddies.* in Gills bay ; Stroma flood eddy ; between Switha and Cantick head ; Liddel eddy ; Swona flood eddy ; and Pentland Skerries flood eddy.

There are four eddies on the West-going stream—Stroma ebb eddy ; Lother reef eddy ; Swona ebb eddy ; and Pentland Skerries ebb eddy.

A detailed description of these races and eddies will be found in North Sea Pilot, Part II., fourth edition.

TIDES AND TIDAL STREAMS ON THE EAST COAST OF SCOTLAND AND ENGLAND.

In the North sea the tidal undulation enters from the Atlantic *General* ocean between the coast of Norway and the British isles, and *remarks.* passes through the various channels formed by the Shetlands, the Orkneys, and the north point of Scotland. The average rate of the stream in the offing is very moderate, not exceeding a knot and a half ; but that part of the stream which enters by the Pentland firth acquires a furious rapidity, amounting at spring tides even to 8 knots. Immediately on quitting the firth, however, it abates in strength, as it diverges into open water.

The following remarks will assist the seaman in tracing the movement of the stream along the coast :—

Off Clythness and Ord head its rate is about 3 knots at the *Off Clythness.* springs and $1\frac{1}{2}$ with the neaps, and it runs to the southward until high water at Wick, or 3h. 20m. before high water at Leith. Off Covesea point, Burgh head, and thence westward towards Fort George and Cromarty, it runs about an hour longer.

Off Cullen the stream sets slowly to the eastward, increasing *Off Cullen.* in velocity as it advances : off Troop head it runs till 1h. 20m. before high water at Leith ; off Kinnaird head it attains the rate of 2 knots on springs, and is still accelerated as it passes Rattray Brigs till off Peterhead, which is occasioned by the junction of the *Off Peterhead.* direct stream from Duncansby head. Six miles off Kinnaird head the stream runs to the southward whilst the tide is rising at Leith ; and at 12 miles till 40 minutes after high water at Leith.

Off Buchanness the stream attains its greatest strength, namely 4 knots on the springs, and $2\frac{1}{2}$ on the neaps ; but off Newburgh it decreases to less than 2 knots, and ceases at high water at Leith : and at 4 or 5 leagues in the offing it runs till 40 minutes after high water at Leith.

The stream runs past Girdleness till 10m. after high water at Leith ; springs at the rate of $2\frac{1}{2}$, neaps $1\frac{1}{2}$ knots. It runs across the mouth of Montrose harbour and past Red head till *Off Aberdeen* 40 minutes after high water at Leith. From Red head it *and Montrose.* sets into St. Andrews bay till the last quarter, which sets South

and S.S.E.; but to the westward of Red head it sets W.S.W. past Arbroath and over the Tay bar.

Tidal streams at light-vessels off east coast of Scotland.					
Hours.	**North Carr light-vessel.** [*]		**Hours.**	**Abertay light-vessel** [†]	
	Direction.	Rate, knots.		Direction.	Rate, knots.
Before high water, Dover. {5 4 3 2 1	N.E. N. by E. N. N. Variable.	o to 1½ ¼ ,, 2½ ½ ,, 1½ o ,, ¾ o ,, ¾	Before high water, Leith. {5 4 3 2 1	N.W. N.W. by W. W. by N. W. W. by S.	o to ½ ½ ,, 1½ ¾ ,, 1½ ¼ ,, 1½ ½ ,, 1
High water	Variable.	o ,, 1	High water	W.S.W.	o ,, ½
After high water, Dover. {1 2 3 4 5 6	S. S. by W. S. S. by E. S.S.E. Ely.	o ,, 1½ o ,, 1½ ½ ,, 1½ o ,, 1½ o ,, 1½ o ,, 1	After high water, Leith. {1 2 3 4 5 6	E.S.E. S.E. by E. ½ E. S.E. by E. ¼ E. S.E. by E. S.E. by E. S.E. by E.	o ,, 1 ½ ,, 2½ 1 ,, 3 1 ,, 3½ 1 ,, 3½ ½ ,, 2½

Bell rock.   At 2 miles without the Bell rock lighthouse the flood continues running to the southward till 2h. 55m. after high water at Leith; but between the Bell rock and Fifeness it changes 2 hours earlier. The first part of the latter stream sets towards May island, the middle to the southward, and the last part S.S.E. The first part of the ebb sets from E.N.E. to N.E., the middle N.N.E., and the last part more northerly.

St. Abb's head.   About a mile off St. Abb's head the flood stream runs to the south-eastward till 2h. 55m. after high water at Leith, or 1½ hours before high water at Hull; but at 5½ or 6 leagues in the offing it continues a quarter of an hour later. About 3 miles off Berwick it runs till 4h. 10m. after high water at Leith or until high water at Hull.

At 5 miles off North Sunderland point, and at the same distance south-eastward of the Staples, the flood stream continues till 3h. 25m. after high water at Leith, or three-quarters of an hour before high water at Hull.

Blyth and Tyne.   About 2 miles off Blyth harbour, and 4 miles off Tynemouth, it runs to the southward till 3h. 40m. after high water at Leith, or half an hour before high water at Hull; and at 4 miles off Sunderland, a quarter of an hour later.

Hartlepool and Whitby.   At 3 or 4 miles off Hartlepool, and at the same distance off Whitby, the flood stream runs to the southward till 4h. 10m. after high water at Leith, or until high water at Hull; and at the same distance off Flamborough head it continues to run half an hour longer.

Near the Norfolk and Suffolk coasts the streams of tide run nearly parallel to the shore. Off Wells the stream runs to the east-ward till 2½ hours after high water at Hull, or 3 hours after high water on the shore.

Off Cromer.   Four miles off Cromer, and the same distance off Hasborough, the flood stream runs along shore to the southward till one hour before high water at Dover, and the ebb in a contrary direction.

Yarmouth.   At Yarmouth, the sea level remains nearly stationary from about an hour before until about an hour after, both high and low waters

* The streams appear to be greatly affected by the wind.
† The west-going stream is very irregular in direction, and varies 2 to 3 points on either side of the directions given.

by the shore. In the road, the tidal stream usually runs to the
southward until it is high water at Dover, and to the northward
until it is low water at that place ; similarly in the haven, the
stream makes in till it is high water at Dover, and *vice versâ*,
notwithstanding the tide is falling or rising.   Thus, vessels
entering the haven at high or low water by the shore, experience
the disadvantages of the full strength of the stream setting across
the entrance, and into or out of the haven.

At 2½ miles off Lowestoft the stream continues to run to the *Lowestoft.*
S.S.W. till about half an hour before high water at Dover.

At Orfordness the South-going stream continues to run till about *Orfordness.*
one hour after high water at Dover ; and sets W.S.W., and the
contrary stream E.N.E.

The streams therefore along the east coast of Scotland and *General.*
England may be referred to 3 standard ports, viz. :—Leith,
Hull, and Dover.   Leith governing the stream from Rattray head
to the Firth of Forth ; Hull from St. Abb's head to the Wash ;
and Dover from Cromer to the Thames.   In these localities the
streams will be found setting in a southerly direction whilst the
tide is rising at the Standard port, and in a northerly direction
when falling there.

At Margate it is high water about 11h. 40m. by the ground. *Margate.*
Near the east buoy of Margate sand, at the first of the flood, on
the shore the stream sets S. by W., veering westward, till about
half flood, or 9h. 15m. ; it then sets west, and continues veering, till
at high water it falls slack at N.N.W.   The ebb stream begins at
N.E., veering eastward, and increasing in strength till about half
ebb, or 2h. 45m., when it sets S.E. by E., still veering, and the
latter part with diminished velocity, till at low water it falls
slack at south.

In the river Medway the stream runs up in mid-channel from *Medway.*
twenty to twenty-five minutes after high water at Sheerness
dockyard ; but at the Nore light-vessel, although it is high water
by the ground a few minutes earlier than at the dockyard, the
stream runs up the Thames for half an hour after high water at
the yard.*

· It remains to be noticed that the direction of strong winds, as
well as the varying pressure of the atmosphere, considerably
affect both the times and the heights of high water.†   Thus in
the North sea a strong N.N.W. gale combined with a low barometer
raises the surface 2 or 3 feet higher, and causes the stream to flow
all along the coast from the Pentland firth to London half an hour
longer than the times and heights predicted in the tables.   Easterly,
S.E., and S.W. winds produce opposite effects, which will be
felt as far down the channel as Dungeness.   On the contrary,
at the entrance of the channel, at Plymouth, and as far up as
Portland, south-westerly winds, with a low barometer, raise
the surface of the water ; and north-easterly winds and a high
barometer always lower it.

* The tidal range of the river Thames has of late years gradually increased,
due to the removal of shoal beds and improvements on the banks ; the tidal wave
having thus free scope.

† It has been observed that the wind frequently accompanies the tide around
the British islands, a south-westerly wind blowing up the English and Irish
channels, and a northerly wind in the North sea.   From these causes consider-
able differences in range of two successive tides may occur.

TIDES AND TIDAL STREAMS IN THE ESTUARY AND RIVER THAMES.

Average duration of tidal streams.

	Flood.	Ebb.	Whole Tide.
	H. M.	H. M.	H. M.
Deptford ...	5 30	6 55 ⎫	
Erith ...	5 51	6 34 ⎬	12 25
Gravesend ...	5 57	6 27 ⎪	
Southend ...	6 3	6 22 ⎭	

Vertical range and mean level of tide.

The highest tide on record in the Thames occurred on 18th January, 1881, on which occasion it rose 4 ft. 10 ins. (17·33 above Ordnance datum) above Trinity high water at London bridge, and 3 ft. 9 ins. above Trinity high water (16·25 above Ordnance datum) at Gravesend. Trinity high water, as fixed by Act of Parliament 1800, is 12·53 feet above Ordnance datum.

Observations taken September — November, 1882, show the average vertical range of tide at the following places to be—

				FEET.
Southend pier ...	...	...	...	14·36
Gravesend pier	...	...	...	16·57
Erith pier ...	...	...	...	17·55
Deptford Cattle market	...	...	...	18·29
Teddington lock	...	...	...	3·70

The range of a single tide on 28th September, 1882, was—

				FEET.
Southend pier ...	...	...	...	19·2
Gravesend pier	...	...	...	21·4
Erith pier ...	...	...	...	22·7
Deptford Cattle market	...	...	...	23·8
Teddington lock	...	...	...	9·1

The greatest range from highest high water to lowest low water of different tides was—

				FEET.
Southend pier ...	...	...	...	19·6
Gravesend pier	...	...	...	22·3
Erith pier ...	...	...	...	27·5
Deptford Cattle market	...	...	...	28·1
Teddington lock	...	...	...	12·2

The mean tide level is stated to be—

Deptford ...	2·02 ft. above Ordnance datum.
London bridge	2·44 ,,
Battersea ...	2·50 ,,

The observations made in 1882, gave the mean tide level as under—

Southend pier   ...   ...   1·89 ft. above Ordnance datum.
Gravesend pier   ...   ...   1·94   ,,
Erith pier ...   .   1·96   ,,
Deptford Cattle market ...   1·98   ,,
Teddington lock ...   ...   11·00   ,,

Direction and Rate of the Tidal Stream in the Thames Estuary.

Tides at Sheerness.	Girdler light vessel.		knots.	Mouse light vessel.		knots.	Tongue light vessel.		knots.
5 hours before H.W	S.W. by W.	..	½ to 1½	W. by S. ..	..	½ to 1½	W.S.Wly.		slack to 1½
4 do.	W. by S. ½ S.	..	½ to 1½	W. by S. ..	..	1 to 2	W. by Sly.	..	½ to 2
3 do.	W. ½ N. ..	..	½ to 1½	W. by S. ..	..	to 2½	Westerly ..	..	1 to 2
2 do.	W. by N. ..	..	1 to 1½	W. by S. ..	..	½ to 1½	W.N.Wly. ..	..	1 to 3
1 do.	N.W. by W.	..	½ to 1½	West	..	..	½ to 1½	N.W. by Wly.	..	½ to 2½
High water.	N.N.Ely. ..		slack to ½	Slack.			N. Wly. ..		Slack to 1½
1 hour after H.W.	E. by N. ..	..	1 to 1½	E. by N. ..	..	1 to 1½	N.E. by Ely.		slack to 1½
1 do.	East	..	..	1 to 2½	E. by N. ..	..	1½ to 2½	E. by Nly. .	..	1 to 2
2 do.	E. by S. ..	..	1 to 1½	E. by N. ..	..	1½ to 3½	Easterly ..	..	1 to 3
3 do.	E. by S. ..	..	½ to 1½	E. by N. ..	..	½ to 2½	E. by Sly. ..	..	½ to 2½
5 do.	E.S.E.	..	..	½ to 1	E. by N. ..	..	½ to 1½	E.S.Ely.	..	..	½ to 2
6 do.	Southerly	..	Slack to 1	Slack.			S. Ely.	..	Slack to 1½

Tides at Sheerness.	Nore light vessel.		knots.	Black Deep light vessel.		knots.	Edinburgh Channel light vessel.		knots.
5 hours before H.W.	Slack W. by N. ..		½ to 1	W. by S. ..	..	½ to 1½	N.W. by W.	..	½ to 1
4 do.	W.N.W. ..	..	½ to 2	West	..	..	1 to 2	N.W. by W.	..	½ to 1
3 do.	W.N.W. ..	..	1½ to 2½	W. ½ N.	..	..	1 to 2½	N.W.	..	..	1 to 2½
2 do.	W.N.W. ..	..	1½ to 2½	W.N.W. ..	..	1 to 3	N.W.	..	..	1 to 3
1 do.	W.N.W. ..	..	½ to 1½	N.W. by W.	..	1 to 2½	N.W.	..	..	1 to 2½
High water.	Slack.			Slack.			N.W.	.	Slack ½ to 1
1 hour after H.W.	E. by N. ..	..	1 to 2½	E. by N. ..	..	1½ to 2½	E.S.E.	..	..	½ to 1
2 do.	E.S.E.	..	..	½ to 3	East	..	..	1½ to 2½	S.E. by E. ..	..	1 to 2½
3 do.	E.S.E.	..	..	1½ to 3½	East	..	..	1½ to 2½	S.E. ½ E. ..	..	1½ to 3½
4 do.	E.S.E.	..	..	1½ to 3	East	..	..	1 to 2	S.E. .	..	..	1½ to 3
5 do.	E.S.E.	..	..	½ to 2	East	..	.	½ to 1	S.E. ½ S. ..	..	½ to 2
6 do.	E.S.E.		..	½ to 1½	Slack.			Slack	

TIDES IN THE NORTH SEA.

General remarks.

The North sea is affected by certainly two, if not more, undulations, namely : that coming up the English Channel and the other coming round the north coast of Scotland, and between the Orkney and Shetland islands. The east coast of Great Britain appears to be chiefly affected by the northern undulations, whilst the continental coasts of the North Sea are chiefly affected by the channel undulation.

The range of tide along the east coast of Great Britain is at Duncansby ness 10 feet at springs, and this increases to 15 feet at Fife ness, from whence to Flamborough head there is little change ; southward of Flamborough head, however, the range gradually increases until it reaches a maximum of 24 feet in the Wash, it then gradually decreases to a minimum of 5 to 6 feet at Yarmouth, and then again increases to 12 feet at the entrance of the Thames estuary.

Along the continental coasts of the North sea the tidal undulation has this peculiarity, whilst at Ostend with a rise of 17 feet at

*General
remarks.* springs the undulation is normal; as the wave advances eastward
the low water stand gradually increases in length until at the
Hook of Holland, where the range at springs is but 5 feet, the tide
stands near low water for a space of 3 hours. From the Hook of
Holland eastwards this peculiarity becomes gradually reversed, the
low water stand occupying less and less time, and the high water
stand more and more, until at the entrance to the Texel, where the
range at springs is 4 feet, the tide stands at near high water for
3 hours. Eastward of the Texel again the time occupied by the
high water stand gradually decreases until at Rottum, where the
spring range is 7½ feet, the wave again becomes normal until it
finally disappears at the Skaw.

These peculiarities are probably due to the reflection of the North
sea undulation from the coasts of England and Belgium, together
with the undulation which advances up the English channel and
passes through Dover strait, meeting the undulation which travels
southward along the east coast of Great Britain. The waves thus
become superimposed at certain times and places whilst at others
they are widely separated.

TIDAL STREAMS IN THE NORTH SEA.

*Streams turn
with the tides
of Dover.* IN the North sea the general features of the streams correspond
exactly with those of the English channel, but the *direction* of
the stream is reversed. As soon as the intermediate tide is
passed, on coming from the westward, a ship enters the true
stream, which extends from the North Foreland to a line joining
Leman and Ower light-vessel and the Texel. To the northward
of a line joining the Ower and Texel a mixed tide occurs, similar to
that which is experienced off the Start, occasioned by the channel
stream encountering that of the offing stream; and beyond these
limits the time of slack water varies with the advance of the tidal
hour, as at the entrance of the English channel; and with this
peculiarity also, that in a very short distance there occurs a
difference of 3 hours in the time of slack water.

On the continental coast of the North sea from Dunkerque to
Heligoland the tidal streams bear a close resemblance to the
streams in the Channel and southern part of North sea, as they
consist of a pair of opposing or separating streams, the points of
junction or separation being movable between the Hook of
Holland and Ameland island. From the Hook of Holland to
Ameland the streams may therefore properly be designated as
intermediate.

Between Dunkerque and the Hook of Holland the stream will
be found running towards Dover when the tide is rising at that
place and away from it when falling there. Between Ameland
and Heligoland the stream will be found running to the eastward
with the rising tide at Dover and to the westward with a falling
tide there.

At one hour after high or low water at Dover these streams
meet or separate at the Hook of Holland; at 2 hours after off
Ymuiden; at 3 hours after off the Texel; at 4 hours after off
Vlieland; at 5 hours after off Terschelling; and at high water at
Dover this intermediate stream is running from Ameland to
Hook of Holland, and at low water at Dover from Hook of
Holland to Ameland.

On the coast north of Heligoland the stream runs towards
Heligoland with the water rising there, and away from it with the
water falling there.

It is proper here to draw attention to the fact that it is high water at Heligoland at 11h. 48m. F. and C. Mean time of place, or 11h. 16m. G.M.T. So that not only is it high water at Liverpool, Dover, and Heligoland almost at the same moment, but at these three places the streams on each side are setting towards them with a rising tide, and away from them with a falling tide.

The true stream in the southern part of the North sea will *Direction of* always carry a vessel *towards* the North Foreland while the water *true stream.* is *rising at Dover*, and *from it* while it is *falling at that place.** This stream sets nearly N.E. and S.W., except in shore where it sets in the direction of the coast; and at the entrance of the Thames, where it is diverted from its course by the river. The annexed tables will show these deviations and the course of the stream in the channel, which, for the convenience of reference, is also divided into compartments.

The 7th compartment comprises the entrance to the Thames; *North sea* viz., at the Sunk, Long sand, Kentish Knock, and Galloper light- *divided into 15* vessels, and 5 miles north of the North Foreland. *compartments.*

The 8th compartment comprises a space between the mouth of the Thames and the coast of the Netherlands, south of 52° N., also Outer Gabbard, North Hinder, and Schouwen bank and other light-vessels.

The 9th compartment comprises between 52° and 53° N., the English coast as far as 2° E.. also Shipwash, Corton, Saint Nicholas gat, Cross sand, Cockle, Newarp, Would, Smith's knoll, and Haisbro light-vessels.

The 10th compartment comprises between 52° and 53° N., and from 2° to 3° E.

The 11th compartment comprises between 52° and 53° N., and from 3° to 4° E., and the Maas light-vessel.

The 12th compartment comprises between 52° and 53° N., and from 4° E. to the coast of the Netherlands, and the Haaks light-vessel.

The 13th compartment comprises between 53° and 54° N., both eastward and westward of 1° E., also Outer and Inner Dowsing, Spurn and Dudgeon light-vessels.

The 14th compartment comprises between 53° and 54° N., and from 1° to 3° E., also Leman and Ower light-vessel.

The 15th compartment comprises between 53° and 54° N., and from 3° to 5° E., also Terschelling bank light-vessel.

The 16th compartment comprises from 1° to 8° E., on the parallel of 54° N.

The 17th compartment comprises from 0° to 8° E., on the parallel of 55° N.

The 18th compartment comprises from 1° to 8° E., on the parallel of 56° N.

The 19th compartment comprises from 2° W. to 8° E., on the parallel of 57° N.

The 20th compartment comprises from 3° W. to 3° E., on the parallel of 58° N.

The 21st compartment comprises from 2° W. to 0°, on the parallel of 59° N.

The current at Skagen light-vessel usually sets to the Eastward (E.S.E.), its rate being much affected by wind; in gales from Westward, it has been recorded as running at 3 knots. With Easterly winds the current sets to Northward, its extreme rate being 2 knots. It seldom sets in any other direction.

* On the banks near the Netherlands coast, between the Texel and Schelde, where there is scarcely any rise of tide, the stream continues to run nearly 40 minutes longer than in other parts of the channel.

TABLE showing the MAGNETIC DIRECTION of the TIDAL STREAMS in the NORTH SEA from a line joining SPURN POINT and HELIGOLAND to the NORTH FORELAND at every hour of the tide at DOVER.

COMPARTMENT VII.
Entrance to the Thames.

Hours.	Sunk light-vessel.		Long Sand light-vessel.		Kentish Knock light-vessel.		Galloper light-vessel.	
	Course.	Rate, knots.	Course.	Rate, knots.	Course.	Rate, knots.	Course.	Rate, knots.
After high water, Dover. 1	Slack—E.N.E.	½ to 1½	Slack—N.E.	½ to 1	N.E.	½ to 1½	N.E.	½ to 1¾
2	E.N.E.	1 „ 2¾	N.E. by E. ½ E.	¾ „ 2½	N.E.	¾ „ 2½	N.E.	1 „ 2½
3	E.N.E.	1½ „ 3	N.E. by E. ¼ E.	1 „ 2½	N.E.	1½ „ 2½	N.E.	1½ „ 2¾
4	E.N.E.	1½ „ 3	E.N.E.	1 „ 2½	N.E.	1½ „ 2¾	N.E.	1½ „ 2½
5	E.N.E.	1 „ 2½	E. by N.	¾ „ 1½	N.E.	½ „ 2½	N.E.	¾ „ 2
6	E.N.E.	½ „ 1½	E.S.E.—Slack.	½ „ 1	Slack.	..	N.E.	½ „ 1
Before high water, Dover. 5	Slack.	..	Slack.—Sly.	½ „ 1½	S.W.	½ to 2	Turning.	..
4	S.W. to W.S.W.	¾ to 2½	S. by W.	1 „ 2¾	S.W.	¾ „ 2¾	S.W.	½ to 2½
3	W.S.W.	1½ „ 3	S.S.W.	1½ „ 3	S.W.	1 „ 3	S.W.	1 „ 2½
2	W.S.W.	1½ „ 2¾	S.S.W.	1½ „ 3	S.W.	1 „ 2½	S.W.	¾ „ 2
1	W.S.W.	1½ „ 2	S.S.W.	1 „ 2½	S.W.	½ „ 2½	S.W.	½ „ 1½
High water.	W. to W.S.W.	½ „ 1½	S.W.—Slack.	½ „ 1½	..	..	Turning.	..

COMPARTMENT VIII.
Between the mouth of the Thames and the Netherlands coast, south of 52° N. latitude.

Hours.	Outer Gabbard light-vessel.		North Hinder light-vessel.		Schouwen bank light-vessel.		West Hinder light-vessel.	
	Course.	Rate, knots.	Course.	Rate, knots.	Course.	Rate, knots.	Course.	Rate, knots.
After high water, Dover. 1	Turning.	..	Turning from E. to N.E.	½ to ½	Slack, turning from S. to E.	0 to ½	E.N.E.	½ to 1
2	N.E. by N.	½ to 2½	N.E.	¾ „ 1½	E.N.E.	1 „ 2	E.N.E.	1¼ „ 1½
3	N.E. by N.	1½ „ 2¾	N.E. by N.	1 „ 1¾	N.E. by E.	1½ „ 2½	E.N.E.	1½ „ 2
4	N.E. by N.	1½ „ 2½	N.N.E.	1 „ 2	N.E. ¼ E.	1½ „ 2½	E.N.E.	1 „ 1½
5	N.E. by N.	¾ „ 2	N.N.E.	¾ „ 1	N.E. ½ N.	1 „ 1½	N.N.E.	½ „ 1
6	N.E. by N.	0 „ 1¼	N. turning to W.	½ „ ½	N. by E.	½ „ ¾	N.N.W. to W.	½
Before high water, Dover. 5	Turning.	..	W. turning to S.W.	½ „ ½	Slack, turning from N. to W.	0 „ ½	W.S.W.	½ to ¾
4	S.W. by S.	½ „ 2¾	S.W.	½ „ 1	W. by S. ½ S.	½ „ 1	W.S.W.	¾ „ 1½
3	S.W. by S.	1½ „ 3	S.W. by S.	1 „ 1¾	S.W. by W. ½ W.	¾ „ 1¾	W.S.W.	1 „ 1¾
2	S.W. by S.	1½ „ 2¾	S.S.W.	1 „ 1½	S.W. by W.	1 „ 2	W.S.W.	1 „ 1¾
1	S.W. by S.	1 „ 2½	S.S.W.	¾ „ 1½	S.W.	1 „ 2	S.Wly.	½ „ 1¾
High water.	S.W. by S.	½ „ 1½	Turning from S. to E.	½ „ ½	S.S.W.	½ „ ¾	S. to S.E.	½ „ ½

COMPARTMENT VIII.—*continued.*

Hours.	West of 2° E.		Between 2° and 3° E.		East of 3° E.		Wandelaar light-vessel.		Wielingen light-vessel.	
	Course.	Rate, knots.	Course.	Rate, knots.	Course.	Rate, knots.	Course.	Rate, knots.	Course.	Rate, knots.
After high water, Dover. 1	N.E.		E.N.E.		N.E. by E.		E. by N.	1 to 1½	E.	1½ to 2½
2	N.E.		N.E. by .		N.E.		E.N.E.	1 .. 2	E.	1½ .. 2
3	N.E.		N.E.		N.E.		N.E. by N.	1 .. 1½	E.	1 .. 1½
4	N.E. by E.		N.E.		N.E.		N.N.E.	½ .. 1	E.N.E.	½ .. 1
5	N.E.		N.E.		N.E.		Nly.	½ .. ½	N. to W.	½ .. ½
6	N.E.		N.E.		N.N.E.		N.W. to W.	½ .. 1	W.	1 .. 1½
Before high water, Dover. 5	S.W. by S.		S.W. by W.		S.W. by W.		W. by S.	1 .. 1½	W.	1½ .. 2½
4	S.W. by S.		S.W.		S.W.		W.S.W.	1 .. 1½	W.	1½ .. 1½
3	S.W. by S.		S.W. by S.		S.W.		S.W. by S.	1 .. 1	Wly.	1 .. 1
2	S.W. by S.		S.W. by S.		S.W.		S.S.W.	½ .. 1	S.W. to S.E.	½ .. 1
1	S.W. by S.		S.W. by S.		S.W.		Sly.	½ .. ½	S.Ely.	½ .. 1
High water ..	..		..		..		S. to S.E.	½ .. 1	E.	1 .. 2

Hours.	Ruytingen light-vessel.		Dyck light-vessel.		Snouw light-vessel.	
	Course.	Rate, knots.	Course.	Rate, knots.	Course.	Rate, knots.
After high water, Dover. 1	N.E. by E.	½ to 1½	East.	½ to 1½	E. ¼ N.	¾ to 2½
2	N.E. by E.	½ .. 1½	East.	½ .. 1½	E. ½ N.	½ .. 1½
3	N.E.	½ .. 1½	E. by N.	½ .. 1½	E. by N.	½ .. 1½
4	N.E. by N.	½ .. 1	E. by N.	0 .. ½	E. by N.	0 .. ½
5	N.E. by N.	½ .. ¾	..	..	Slack.	..
6	Slack.	..	..	..	W. by N.	½ to ½
Before high water, Dover. 5	W. by S.	½ to 1½	..	..	W. ½ N.	½ .. 1½
4	S.W.	½ .. 1½	West.	½ to 1½	W. ½ N.	½ .. 1½
3	S.W.	½ .. 1½	West.	½ .. 1½	W. ½ N.	½ .. 1½
2	S.W. by S.	½ .. 1½	West.	0 .. ½	W. ½ N.	½ .. 1
1	S. by W.	0 .. 1	East.	0 .. ½	East.	0 .. ½
High water ..	E.N.E.	0 .. 1	East.	½ .. 1½	E. ¼ N.	½ .. 1½

COMPARTMENT IX.

Between latitude 52° and 53° N. and the English coast, as far as 2° E. longitude.

Hours.		REMARKS.

After high water, Dover. {1 2 3 4 5 6} Stream sets northward.

Taking the direction of the land, except close to the banks, for which special instructions are necessary.

Before high water, Dover. {5 4 3 2 1} Stream sets southward.

Hours.	Shipwash light-vessel.		Corton light-vessel.		St. Nicholas gat light-vessel.	
	Course.	Rate, knots.	Course.	Rate, knots.	Course.	Rate.
H. W.	S.W. by W., Slack.	½ to 1	S. by W.	Slack to ½	Turning.	
After high water, Dover. 1	Slack, N.E. by E.	½ „ 1½	N. by E.	½ „ 2	N.N.E.	
2	N.E. by E.	1 „ 2½	N. by E.	1½ „ 3	N. by E.	
3	N.E. by E.	1½ „ 2½	N. by E.	1½ „ 3½	N. by E.	
4	N.E. by E.	1½ „ 2½	N. by E.	1½ „ 2¾	N. by E.	
5	N.E. by E	¾ „ 1¾	N. by E.	1 „ 1¾	North.	
6	N.E. by E., Slack.	¼ „ ¾	N. by E.	Slack „ ¾	North.	
Before high water, Dover. 5	S.W. by W.	¼ „ 1¾	S. by W.	„ „ 1¾	N.W. by N.	
4	S.W. by W.	1 „ 2½	S. by W.	¾ „ 2½	Sly.	
3	S.W. by W.	1½ „ 2¾	S. by W.	1 „ 2½	South.	
2	S.W. by W.	1½ „ 2½	S. by W.	1 „ 2	South.	
1	S.W. by W.	1 „ 2	S. by W.	½ „ 1½	South.	

Greatest rate, springs, 2½ knots.

COMPARTMENT IX.—*continued.*

Hours.	Cross Sand light-vessel.		Cockle light-vessel.		Newarp light-vessel.	
	Course.	Rate, knots.	Course.	Rate.	Course.	Rate, knots.
H. W.	S. by W. ¼ W.	¼ to 1¾	N. by W.	Slack to ¼	Slack.	..
After high water, Dover. 1	N. by E.	0 „ 1¾	N. by W.	¼ „ 1¾	N. by W.	1½ to 2
2	N. by E. ¼ E.	1 „ 3¼	N. by W.	1 „ 2½	N. by W.	2 „ 3½
3	N. by E. ½ E.	1¼ „ 4	N. by W.	1 „ 2½	N. by W.	2 „ 4
4	N. by E. ½ E.	1½ „ 3½	N. by W.	¾ „ 1¾	N. by W.	1¾ „ 3½
5	N. by E. ½ E.	1 „ 2¾	N. by W.	¼ „ 1	N. by W.	¾ „ 2½
6	N. by E. ⅜ E.	¼ „ 1½	S. by E.	Slack „ 1	Slack.	..
Before high water, Dover. 5	S. by W.	0 „ 1¾	S. by E.	¼ „ 2½	S. by E.	1 to 3
4	S. by W. ½ W.	1 „ 2¾	S. by E.	1 „ 2½	S. by E.	2 „ 4
3	S. by W. ¼ W.	1¾ „ 4	S. by E.	1 „ 2½	S. by E.	2 „ 3¾
2	S. by W. ½ W.	1½ „ 3¾	S. by E.	¾ „ 2	S. by E.	1¾ „ 3
1	S. by W. ⅜ W.	1 „ 2¼	S. by E.	¼ „ 1¼	S. by E.	1 „ 2

Hours.	Would light-vessel.		Smiths Knoll light-vessel.		Haisbro light-vessel.	
	Course.	Rate, knots.	Course.	Rate, knots.	Course.	Rate knots.
H. W.	Slack.	..	S. by W.	0 to 1½	N. by W. ¼ W.	0 to 1
After high water, Dover. 1	N.N.W.	½ to 1¾	N. by W.	0 „ ¾	N. by W. ¼ W.	1 „ 2¼
2	N.N.W.	1 „ 2½	N. ½ W.	½ „ 1¾	N. by W. ½ W.	1½ „ 3
3	N.N.W.	1½ „ 2½	North.	¾ „ 2½	N. by W. ½ W.	1½ „ 3
4	N.N.W.	1½ „ 2½	North.	1 „ 2¾	N. by W. ½ W.	1 „ 2
5	N.N.W.	¾ „ 1½	North.	¾ „ 2½	N. by W. ½ W.	0 „ 1
6	Slack.	..	N. by E.	0 „ 1½	S. by E. ½ E.	0 „ 1
Before high water, Dover. 5	S.S.E.	¼ „ 1½	S. by E.	0 „ 1	S. by E. ½ E.	1 „ 2
4	S.S.E.	1 „ 2½	S. ¼ E.	½ „ 2	S. by E. ¼ E.	1½ „ 2½
3	S.S.E.	1½ „ 2½	South.	1 „ 2½	S. by E. ½ E.	1½ „ 2½
2	S.S.E.	1½ „ 2	South.	1½ „ 2½	S. by E. ¼ E.	1 „ 2
1	S.S.E.	½ „ 1½	S. ½ W.	1 „ 2	S. by E. ¼ E.	0 „ 1

COMPARTMENT X.

Between latitude 52° and 53° N. and longitude 2° to 3° E.

Hours.	S.W. quarter.	Rate.	S.E. quarter.	Rate.	N.E. quarter.	Rate.	N.W. quarter.	Rate.	REMARKS.
After high water, Dover. 1	N.E. by N.		N.E. by N.		N.E. by N.*		N.N.W.		* Turning sharply towards Leman and Ower shoal.
2	N.E. by N.		N.E. by N.		N.E. by N.		Sly.		
3	N.E. by N.	Greatest rate, springs, 2½ knots.	N.E.	Greatest rate, springs, 1½ knots.	N.N.E.	Greatest rate, springs, { flood 2½ ebb } knots.	N.N.E.	Greatest rate, springs, { flood 2½ ebb 3 } knots.	
4	N.E. by N.		N.E. by N.		N.E.		N. by W.		
5	N.E. by N.		N.E. by N.		N.E. by N.		N. by W.		
6	N.E. by N.		N.E. by N.		N.N.E.		N.N.E.		
Before high water, Dover. 5	S.W. by S.		S.W.		S. by E.		Sly.		
4	S.W. by S.		S.W. by S.		S. by E.		Sly.		
3	S.W. by S.		S.W. by S.		S. by W.		Sly.		
2	S.W. by S.		S.W. by S.		S.S.W.		S. by W.		
1	S.W.		S.W. by S.		S.W. by S.		S. by W.		

COMPARTMENT XI.

Between latitude 52° and 53° N. and longitude 3° to 4° E.

Hours.	S.W. quarter.	Rate.	S.E. quarter.	Rate.	N.E. quarter.	Rate.	N.W. quarter.	Rate.	Maas light-vessel.	
									Course.	Rate, knots.
After high water, Dover. 1	N.E. by N.		Slack.		N.E. by N.		N.E. by N.		W.S.W. or N.E.*	0 to 1
2	N.E. by N.		N.E. by N.		N.E. by N.		N.E. by N.		N.E. by N.	½ „ 1
3	N.E. by N.	Greatest rate, springs, 2 knots.	N.E. by N.	Greatest rate, springs, 2¼ knots.	N.E. by N.	Greatest rate, springs, { flood 1¾ ebb 2 } knots.	N.E. by N.	Greatest rate, springs, { flood 1¾ ebb 2 } knots.	N.E.	½ „ 2
4	N.E. by N.		N.E. by N.		N.E.		N.E. by N.		N.E.	¾ „ 2½
5	N.E. by N.		N.E. by N.		N.E. by N.		N.E. by N.		N.E.	½ „ 1½
6	N.E. by N.		N.E. by N.		N.E. by N.		N.E. by N.		N.E. by E.	½ „ 1
Before high water, Dover. 5	S.W. by S.		S.W. by S.		S.S.E.		S.E. by S.		E.N.E. or S.W.†	0 „ ½
4	S.W. by S.		S.W. by S.		S. by W.		S. by E.		S.W.	0 „ 1
3	S.W. by S.		S.W.		S.W. by S.		S.W. by S.		S.W.	½ „ 1½
2	S.W. by S.		S.W.		S.W. by S.		S.W. by S.		S.W.	½ „ 1½
1	S.W. by S.		S.W.		S.W. by S.		S.W. by S.		S.W.	½ „ 1½
High water.									S.W. by W.	0 „ 1½

* With strong S.W. winds.   † With strong N.E. winds.

COMPARTMENT XII.

Between latitude 52° and 53° N., and from longitude 4° E. to the Netherlands coast.

Hours.		Banks light-vessel.		REMARKS.
		Course.	Rate, knots.	
After high water, Dover. 1	Stream sets northward.	S.W.	½ to 1½	
2		Wly.	0 „ 1	
3		Nly.	0 „ ¾	
4		N.N.E.	½ „ 1½	
5		N.N.E.	1 „ 2½	
6		N.E. by N.	¾ „ 1	The stream takes the direction of the land, except close to the banks for which special instructions are necessary.
Before high water, Dover. 5	Stream sets southward.	N.E.	½ „ 1½	
4		Ely.	0 „ ¾	
3		Sly.	0 „ ¾	
2		S.S.W.	½ „ 1¼	
1		S.S.W.	¾ „ 1½	
High water.	..	S.W. by S.	¾ „ 1¼	

COMPARTMENT XIII.

Between latitude 53° and 54° N., eastward and westward of longitude 1° E.

Hours.		Outer Dowsing L.V.*		Inner Dowsing L.V.†		Spurn L.V.		Dudgeon L.V.‡		Lat. 53¼° N. Long. 0¼° E.	
		Course.	Rate, Knots.	Course.	Rate, Knots.	Course.	Rate.	Course.	Rate, Knots.	Course.	Rate, Knots.
Before high water, Hull.	5	N.N.W.	½ to 2	N.N. Wly.	½ to 1½	S.W.	½ to 2	N.N.W.	1 to 2	N. offshore / S. inshore	0 to ½ / 0 „ ½
	4	N.W. by N.	½ „ 1½	Wly.	½ „ 1½	S.W.	1 „ 2½	N.W.	½ „ 1½	N.	0 „ 1½
	3		Slack.	S.S.W.	½ „ 2½	S.W.	1 „ 3	Wly.	Slack to 1	S.	½ „ 2½
	2	S. by E.	1½ to 1½	S.S.W.	½ „ 2½	S.W.	1 „ 2½	S.W. by S.	Slack to 1	S.	1 „ 2½
	1	S.S.E.	1 „ 2½	S. by W.	½ „ 2	S.W.	½ „ 1½	South.	½ to 1½	S.	½ „ 2½
H.W.		S.S.E.	1 „ 2	Sly.	½ „ 1½	S.W.	½ „ 1½	S. by E.	½ „ 1½	S. { inshore / offshore	0 „ ½ / ½ „ 1½
After high water, Hull.	1	S.S.E.	½ „ 1½	S.Ely.	½ „ 2½	N.E. by E.	½ „ 1½	S.E. by S.	1 „ 1½	S. inshore / S. by E. off-shore.	0 „ ½ / 0 „ ½
	2	S.E. by S.	½ „ 1½	Ely.	½ „ 1½	N.E. by E.	½ „ 3½	S.E. by E.	1 „ 1½	inshore / offshore	½ „ 1½ / 0 „ 1
	3		Slack.	N.E.	½ „ 2	N.E. by E.	1½ „ 2½	Ely.	Slack to 1	N.	½ „ 2
	4	North.	½ to 1½	N.N.E.	½ „ 2	N.E. by E.	1 „ 3½	N.E. by E.	Slack to 1	N.	1 „ 2
	5	N. by W.	½ „ 2½	N.N.E.	½ „ 2	N.E. by E.	1 „ 2½	North.	½ to 1½	N.	½ „ 2
	6	N.N.W.	½ „ 2½	N. by E.	½ „ 2	N.E. by E.	½ „ 1½	N. by W.	½ „ 2	N. { inshore / offshore	0 „ ½ / ½ „ 1½

* With strong winds the stream runs to leeward ½ to ½ knots at the hours marked Slack.
† The direction of the stream at H.W. at Hull, and 1 and 2 hours after, and 5 and 4 hours before, is greatly affected by the wind.
‡ The tidal streams at the Dudgeon light-vessel are much affected by the wind.

COMPARTMENT XIV.

Between latitude 53° and 54° N., and longitude 1° to 3° E. *

Hours.	S.W. quarter.	Rate.	S.E. quarter.	Rate.	N.E. quarter.	N.W. quarter.	Leman & Ower light-vessel. Course.	Rate, knots.
After high water, Dover. 1	N.W. by N.		N.N.W.		N.W. by N.	N. by W.	N.N.W. ½ W.	½ to 1½
2	N.W.	knots.	N.N.W.	knots.	N. by W.	N. by W.	N.N.W.	1 „ 2
3	N.W. by N.		North.		Nly.	N.N.W.	N.N.W.	1 „ 2½
4	N.W. by N.		North.		N. by E.	N.W. by W.	N.N.W.	1 „ 2½
5	N.W. by N.	flood 2½ ebb 2½	North.	flood 2½ ebb 2½	N.E. by E.	S. by W.	N.N.W.	1½ „ 1½
6	..		N.N.E.		S.E. by E.	S. by E.	Slack.	..
Before high water, Dover. 5	S.E. by S.		S.E. by S.		S.E.	S. by E.	S.S.E. ½ E.	½ „ 1½
4	S.E. by S.	Greatest rate, springs.	S.E. by S.	Greatest rate, springs.	S. by E.	S.S.E.	S.S.E.	1 „ 2½
3	S.E. by S.		S.S.E.		S. by E.	S.E. by S.	S.S.E.	1 „ 2½
2	S.S.E.		S. by E.		Sly.	E. by S.	S.S.E.	¾ „ 1½
1	S.E. by S.		Sly.		S. by E.	N.N.E.	S.S.E.	0 „ 1

* Near the north point of Smiths Knoll the rates are flood 2½, ebb 3 knots.

COMPARTMENT XV.†

Between latitude 53° and 54° N., and longitude 3° to 5° E.

Hours.	S.W. quarter.	Rate.	S.E. quarter.	Rate.	N.E. quarter.	Rate.	N.W. quarter.	Rate.	Terschelling bank light-vessel. Course.	Rate, knots.
After high water, Dover. 1	W. by N.		W.S.W.		W. by S.		S.W.		W.S.W.	1 to 1½
2	N.W. by N.		W.S.W.		W. by S.		W.N.W.		W.S.W.	1 „ 1½
3	N.N.W.	knots.	W. by S.	knots.	W. by S.	knots.	N.W.	knots.	W.S.W.	¾ „ 1½
4	N. by E.		N.W. by N.		N.W. by N.		N.N.W.		West.	½ „ 1
5	N.E. by N.		N.E. by N.		N.E. by N.		N.N.E.		Slack, turning from West to N.E.	0 „ ½
6	N.N.E.	flood 1½ ebb	N.E. by E.	flood 1½ ebb 3	E. by N.	flood 2? ebb	E.N.E.	flood ebb	N.E.	1 „ 1½
Before high water, Dover. 5	East.		E.N.E.		Ely.		E.S.E.		E.N.E.	1½ „ 2
4	S.E.	Greatest rate, springs.	E.N.E.	Greatest rate, springs.	E. by S.	Greatest rate, springs.	S.E. by E.	Greatest rate, springs.	E.N.E.	1½ „ 2
3	S.S.E.		S.S.W.		S.E. by E.		S. by E.		E.N.E.	1½ „ 2
2	S. by W.		S.S.W.		S.E.		S.W. by S.		East.	¾ „ 1½
1	S.W. by S.		S.W. by S.		S. by E.		S.W. by S.		Slack, turning from East to South.	0 „ ½
H. W.	..		..		..		..		S.W. ½ W.	¾ „ 1½

† In the north-eastern quarter of this compartment, the Heligoland stream joins the channel stream on the falling water at Dover, and the streams split on the rising water at Dover. A vessel northward of lat. 53° 30' on the rising tide will be set towards Heligoland. Splitting on Texel Island.

COMPARTMENT XVI.

On the parallel of 54° N.

Hours.	1° E.		2° E.		3° E.		4° E.	
	Course.	Rate.	Course.	Rate.	Course.	Rate.	Course.	Rate.
After high water, Dover. 1	N.N.W.		N.W. by N.		N.W. by W.		W.N.W.	
2	N.N.W.		N.W.		W.N.W.		W. by N.	
3	N.W.		N.W. by W.		W.N.W.		Wly.	
4	S. by E.		N. by W.		N.W.		N. by W.	
5	S. by E.		W. by S.		N.N.W.		N.E. by N.	
6	S.E. by S.		S.S.E.		E.N.E.		E. N.E.	
Before high water, Dover. 5	S.E.		S.E.		E. by S.		E. by N.	
4	E.S.E.		S.E. by E.		E. by S.		Ely.	
3	East.		S.E. by E.		E. by S.		Ely.	
2	N.E. by N.		S.S.E.		E. by S.		S.E. by E.	
1	N. by E.		E.N.E.		South.		S.S.E.	

Hours.	5° E.		Borkum Flat light-vessel.		Weser light-vessel.		Eider light-vessel.	
	Course.	Rate.	Course.	Rate, knots.	Course.	Rate, knots.	Course.	Rate, knots.
Before high water, Dover. 5	E. by S.		S. Ely.	¼	Irregular (Sly.)	Slight.	W.N.W.	0 to ½
4	E.S.E.		E. by S.	1	Do.	Do.	E.S.E.	¼
3	S.E. by E.		E. by S.	1¼*	S.E. ¼ E.	1½	E.S.E.	¾
2	S.E. by E.		E. by S.	1	S.E. ½ E.	1½‡	E.S.E.	1¼
1	E.S.E.		E. by S.	¾	E.S.E.	1¼	E.S.E.	½
H.W.	—	Greatest rate, 1 knot.	Ely.	¼	E. by S.	1	E.S.E.	¼
After high water, Dover. 1	W.N.W.		N. Wly.	½	Slack.		Slack.	
2	W.N.W.		N.W. by W. ½ W.	¾	N.Wly.	1	W.N.W.	½
3	W. by N.		N.W. by W. ½ W.	¾	N.W.	1¼	W.N.W.	¾
4	W. by N.		W.N.W.	1†	N.W. ½ W.	1½	W.N.W.	1
5	W. by N.		W. by N. ½ N.	⅞	N.W. by W.	1⅘§	W.N.W.	¾
6	W. by N.		Wly.	½	W. by N. ½ N.	1	W.N.W.	½

* Greatest rate observed, nearly 2 knots.   † Greatest rate observed, nearly 1¾ knots.
‡ Greatest rate observed, 2 knots.   § Greatest rate observed, 1¾ knots.
|| Greatest rate observed, 1½ knots.

About the meridian of 8° E., the influence of the rivers Elbe and Weser causes the stream to run nearly two hours to the north-eastward on the falling tide, after it has turned westward in other parts, and on the rising tide to run two hours to the west-ward, after the stream has turned eastward farther west.

COMPARTMENT XVII.

On the parallel of 55° N.

Hours.	0° E. Course.	Rate.	1° E. Course.	Rate.	2° E. Course.	Rate.	3° E. Course.	Rate.	4° E. Course.	Rate.
After high water, Dover 1	N.W. by N.	¼	Slack		N. by E.		W. by S.		N.W.	
2	S. by W.	½	S.W.		S.W. by W.		Wly.		N.W. by W.	
3	S.S.E.	1½	S.S.W.		W.S.W.		Wly.		N.W. by W.	
4	S. by E.	1	S. by W.		S.W.		W.N.W.		N.W. by W.	
5	S. by E.	¾	S. by W.		S. by E.		S.W. by W.		W. by S.	
6	S. by E.	½	South		S.S.E.		S.S.E.		S.E. by S.	
Before high water, Dover 5	S.E.	½	S. by E.		E. by S.		S. by E.		E.S.E.	
4	N.N.E.	½	E.N.E.		Ely.		E.S.E.		E.S.E.	
3	N. by W.	1½	N. by E.		E.N.E.		Ely.		Ely.	
2	N. by W.	1	N. by E.		E. by N.		Ely.		E. by N.	
1	N. by W.	½	N. by E.		N.E.		N.N.E.		N. by E.	

(Rate columns for 1° E, 2° E, 3° E, 4° E: Greatest rate at springs, 1 knot, about half tide.)

Hours.	5° E. Course.	Rate.	6° E. Course.	Rate.	Horn Reefs light-vessel. Course.	Rate, knots.	Vyl Shoal light-vessel. Course.	Rate, knots.
After high water, Dover 1	N.W. by W.		Wly.		Turning through W. N.W. by N.	¼ to 1½	Turning through E. or W. N.W.	0 to 1
2	W. by N.		W. by N.		N.W. by N.	½ ,, 2	N.W.	¼ ,, 1
3	W. by N.		W.N.W.		N.N.W.	1 ,, 2	N.W.	½ ,, 1½
4	W.N.W.		W. by N.		N.N.W.	1 ,, 2	N.W.	1 ,, 1½
5	W.		W. by N.		N.N.W.	¾ ,, 2½	N.W.	¾ ,, 1½
6	Turning.		W.N.W.		N.N.W.	½ ,, 2	N.W.	½ ,, 1½
Before high water, Dover 5	Ely.		S.E.		Nly.	¼ ,, 1¾	N.Wly.*	¼ ,, ½
4	E. by S.		S.E.		Turning through E. S.Ely.	¼ ,, 1	S.Ely.*	0 ,, 1
3	E. by S.		S.E. by S.		S.S.E.	¼ ,, 1½	S.E.	¼ ,, 1½
2	E. by S.		S.E. by S.		S.S.E.	½ ,, 2	S.E.	¼ ,, 1½
1	Ely.		S.E. by S.		S.S.E.	½ ,, 2	S.E.	½ ,, 1½
High water.	..		..		Sly.	¼ ,, 1½	S.E.	½ ,, 1½

(Rate columns for 5° E and 6° E: Greatest rate at springs, 1 knot, about half tide.)

* Or turning through East or West.

COMPARTMENT XVIII.

On the parallel of 56° N.

Hours.	1° E. Course.	Rate.	2° E. Course.	Rate.	3° E. Course.	Rate.	4° E. Course.	Rate.
After high water, Dover. 1	N.N.E.	Greatest rate at springs, ¾ knot, about half tide.	Slack.	Greatest rate at springs, ¾ knot, about half tide.	N.W. by W.	Greatest rate at springs, ¾ knot, about half tide.	Nly.	Greatest rate at springs, ¾ knot, about half tide.
2	Slack.		S.W.		W. by N.		N.W. by N.	
3	Sly.		S.W.		N.W.		N.W. by W.	
4	S. by E.		W.S.W.		N.W. by W.		N.E.	
5	S. by E.		S. by E.		N.N.W.		N.E. by E.	
6	S. by E.		S. by E.		N. by W.		Ely.	
Before high water, Dover. 5	E.S.E.		Ely.		N. by E.		E. by N.	
4	N.E. by E.		E.N.E.		N.E.		E. by N.	
3	N.E. by E.		N.E. by E.		E. by N.		N.E. by E.	
2	N.N.E.		N.E. by E.		N.E.		E.N.E.	
1	N.E.		N.E.		N. by W.		N.E. by E.	

Hours.	5° E. Course.	Rate.	6° E. Course.	Rate.	7° E. Course.	Rate.	8° E. Course.	Rate.
After high water, Dover. 1	Turning.	Greatest rate at springs, ¾ knot, about half tide.	Slack.	Greatest rate at springs, ¾ knot, about half tide.	E.N.E.	Greatest rate at springs, ¾ knot, about half tide.	N.E.	Greatest rate at springs, ¾ knot, about half tide.
2	W. by S.		N.W. by N.		N.N.E.		Nly.	
3	N.W.		N.W. by N.		Nly.		N. by W.	
4	N.N.W.		N.N.W.		N. by. W.		N.N.W.	
5	N.N.E.		N. by W.		N. by W.		N.N.W.	
6	N.E.		N. by E.		N.N.W.		N.N.W.	
Before high water, Dover. 5	E.N.E.		N.E. by E.		N.N.W.		N.W. by N.	
4	N.E. by E.		E.N.E.		N.E.		Nly.	
3	E.N.E.		E. by N.		Ely.		Sly.	
2	E. by N.		Ely.		Ely.		S. by W.	
1	E. by N.		Ely.		S.E. by E.		S.W.	

COMPARTMENT XIX.

On the parallel of 57° N.

Hours.		2° W.		1° W.		0°.	
		Course.	Rate.	Course	Rate.	Course.	Rate.
After high water, Dover.	1	S.S.W.		S. by W.		S. by W.	
	2	S.S.W.		S.W. by S.		S. by W.	
	3	S.W.	Greatest rate, 1¼ knots, at half tide.	S.W. by S.	Greatest rate, 1¼ knots, at half tide.	Sly.	Greatest rate, ¾ knot, about half tide.
	4	N. by W.		W.S.W.		Sly.	
	5	Slack.		Slack.		S. by E.	
	6	N.N.E.		N. by E.		Slack.	
Before high water, Dover.	5	N.E. by N.		N. by E.		N.N.E.	
	4	N.E. by N.		N. by E.		Nly.	
	3	N.N.E.		N.N.E.		N. by E.	
	2	N.N.E.		N.E. by N.		N.N.E.	
	1	S. by E.		N.E by E.		N. by E.	

Hours.		1° E.		2° E.		3° E.		4° E.	
		Course.	Rate.	Course.	Rate.	Course.	Rate.	Course.	Rate.
After high water, Dover.	1	S.S.W.		N. by E.		S.E. by S.		S.W.	
	2	S.W. by S.		S. by E.		S. by E.		W.N.W.	
	3	S.S.W.	Greatest rate, ¾ knot, about half tide.	S.S.E.	Greatest rate, ¾ knot, about half tide.	S. by W.	Greatest rate, ¾ knot, about half tide.	W. by N.	Greatest rate, ¾ knot, about half tide.
	4	S.W. by S.		S.E.		S.W. by W.		N.N.W.	
	5	Slack.		Ely.		Slack.		N.N.W.	
	6	N.E.		E. by N.		Slack.		Nly.	
Before high water, Dover.	5	N.E.		E. by N.		Turning.		N.N.E.	
	4	N.E.		E.N.E.		N.N.E.		N.E. by N.	
	3	E.N.E.		E. by N.		N.E.		N.E. by E.	
	2	E.N.E.		E. by N.		E.N.E.		N.E. by E.	
	1	Slack.		S. by E.		E.S.E.		Ely.	

COMPARTMENT XIX.—*continued.*

Hours.	5° E.		6° E.		7° E.		8° E.	
	Course.	Rate.	Course.	Rate.	Course.	Rate.	Course.	Rate.
After high water, Dover. 1	N. by E.		S.S.E.		N.E. by E.		S.E. by S.	
2	N.N.E.		S. by E.		E.N.E		Slack.	
3	S.W. by S.	Greatest rate, ⅓ knot, about half tide.	Sly.	Greatest rate, ⅓ knot, about half tide.	N.E. by E.	Greatest rate, ⅔ knot, about half tide.	N.N.E.	
4	N.W. by N.		N. by E.		N.E. by E.		N.E. by N.	
5	N. by W.		N. by W.		N.E. by E.		N. by W.	Rate, 1 knot.
6	N. by E.		N. by W.		N. by E.		Nly.	
Before high water, Dover. 5	N.E. by N.		Nly.		N.E. by N.		N.E.	
4	N.E. by N.		N.N.E.		N.N.E.		N.N.E.	
3	N.E.		N.E.		N.E. by N.		N.E. by E.	
2	E. by N.		E.N.E.		N.E. by N.		N.E. by E.	
1	E. by N.		E.N.E.		N.E. by N.		E.N.E.	

COMPARTMENT XX.

On the parallel of 58° N.

Hours.	3° W.		2° W.		1° W.			
	Course.	Rate.	Course.	Rate.	Course.	Rate.	Course.	Rate.
After high water, Dover. 1	S. by E.		S.E. by E.		S. by W.			
2	S.E.		S.E. by E.		S. by W.			
3	E. by N.	Greatest rate, 1 knot, about half tide.	S. by E.	Greatest rate, ⅓ knot, about half tide.	S. by W.	Greatest rate, 1 knot, about half tide.		
4	Ely.		S.E.		Slack.			
5	Slack.		Slack.		N.W. by N.			
6	S.W by S.		N.N.W.		N. by E.			
Before high water, Dover. 5	West.		N.W. by W.		N.N.E.			
4	W. by N.		N.W. by W.		N.E. by N.			
3	W.N.W.		N.W.		N.E.			
2	Wly.		West.		S.E. by S.			
1	Wly.		S. by E.		S.E. by S.			

COMPARTMENT XX.—*continued.*

Hours.		1° E.		2° E.		3° E.	
		Course.	Rate.	Course.	Rate.	Course.	Rate.
After high water, Dover.	1	S.W. by S.	Greatest rate, ½ knot, about half tide.	S.W. by S.	Greatest rate, ½ knot, about half tide.	S.S.E.	
	2	W. by S.		S.W. by W.		S. by E.	
	3	Slack.		W. by N.		South.	
	4	Slack.		N.W.		S. by W.	
	5	N. by E.		Nly.		Sly.	
	6	N. by E.		Nly.		E.N.E.	
Before high water, Dover.	5	N. by E.		Nly.		N.E. by E.	
	4	N. by E.		Nly.		N.E. by E.	
	3	N. by E.		Nly.		E.N.E.	
	2	Turning.		N.E.		E. by S.	
	1	W. by N.		S.E. by E.		E.S.E.	

COMPARTMENT XXI.

On the parallel of 59° N.

Hours.		2° W.		1° W.		0°.	
		Course.	Rate.	Course.	Rate.	Course.	Rate.
After high water, Dover.	1	S.S.W.	Greatest rate, 1 knot, about half tide.	S.S.W.	Greatest rate, ½ knot, about half tide.	S.W. by W.	Greatest rate, ¾ knot, about half tide.
	2	S. by W.		S.S.W.		W.S.W.	
	3	Sly.		S.S.W.		N. by E.	
	4	S.W. by W.		Slack.		N.E. by N.	
	5	Wly.		Slack.		N.E.	
	6	N.W. by W.		Nly.		N.E.	
Before high water, Dover.	5	N.W. by N.		N.W. by N.		N.E.	
	4	N.W.		N.W. by N.		E.N.E.	
	3	W. by N.		N.W.		S.E. by E.	
	2	S.W. by W.		S.W. by W.		S.S.W.	
	1	S.W.		S.W. by S.		S.W. by W.	

All the foregoing bearings are *magnetic.*

TIME

HIGH WATER ON FULL AND CHANGE DAYS;

WITH THE RISE OF THE TIDE

AT SPRINGS AND NEAPS.

INDEX.

As it is desirable that the following list should be made accurate and complete, it is requested that corrections and additions be forwarded to the Secretary of the Admiralty.

TIME

OF

HIGH WATER ON FULL AND CHANGE DAYS,

AT THE PRINCIPAL PLACES ON THE GLOBE;

ARRANGED ACCORDING TO THE APPARENT PROGRESS OF THE TIDE WAVE.

WITH THE RISE OF TIDE AT SPRINGS AND NEAPS.*

When a query, thus ?, is placed after the time of high water and the rise, it indicates that what are given are approximations.

Abbreviations used.—Anch., anchorage; Arch., archipelago; B., bay; Bk., bank; C., cape; Chan., channel; Cr., creek; Dk., dock; Entr., entrance; G., gulf; Hd., head; Hr., harbour; I., island; Is., islands; L., loch; L. V., light-vessel; Lt. Ho., lighthouse; Mt., mount; N., north, &c.; O., ocean; P., port; Pen., peninsula; Pt., point; R., river; Rd., road; Rf., reef; Rk., rock; S., sea; Sd., sound; Sh., shoal; St., Saint; Sta., Santa; Str., strait; N. C., north coast, &c.; U.S., United States.

Place.	High water, full and change.	Rise.		Place.	High water, full and change.	Rise.	
		Springs.	Neaps.			Springs.	Neaps.
England, South coast.							
				Weir Hd., R. Tamar	h. m.	ft.	ft.
	h. m.	ft.	ft.	Weir Hd., R. Tamar	6 17	5¼	1¼
Scilly Is., St. Agnes	4 30	16	12	Warleigh quay, R. Tavy }	5 47	14½	10½
,, St. Mary	4 27	16	12	Maristow ,,	5 47	8½	4½
,, Trescow	4 22	16¼	12¼	Bigbury B., R. Yealm	5 37	16¼	11½
Penzance	4 30	16¼	12½	,, R. Erme	5 40	16½	11½
Lizard, Perran } Vose cove }	5 0	14¼	10½	,, R. Avon	5 47	16½	11½
				Bolt Hd.	5 45	15 ?	11 ?
Coverack	4 35	14½	11¼	Salcombe	5 41	15	11½
Helford, entrance	4 43	15½	11½	,, Kingsbridge	5 46	10	
Falmouth	4 57	16	12	Start point	5 41	15	11½
Truro, town quay	5 5	10	6	Dartmouth	6 16	14½	10½
Mevagissey	5 4	15½	12	Torbay	6 0	13½	10
Fowey	5 14	15	11¾	Teignmouth	6 0	13	9½
East Looe	5 26	16¾	13½	Exmouth	6 27	11	8½
Plymouth breakwater	5 37	15¾	12	Lyme Regis	6 21	11½	8½
,, Sutton } pool }	5 32	15½	12	Bridport	6 5	11¼	7¼
				Chesilton, W. bay	6 13	10¼	7
Devonport Dk. yard	5 43	15½	12	Portland, bill of	6 35	9	6½
Saltash, R. Tamar	5 45	15	11	,, breakwater	7 1	6¾	4½
Cargreen ,,	5 47	14¾	10¾	Swanage B.	8 20 } 0 20 }	6¼	4¼
Pentillie ,,	5 55	13½	9½				
Calstock ,,	6 6	12½	8½	†Poole, entrance {	8 50 } 0 25 }	6½	4¾
Morwellham ,,	6 12	10½	6½				

* By the rise of the tide is meant its vertical rise above the mean low water level of spring tides.

† Over a considerable length of coast between Portland and Selsea bill a double tide is experienced; the first high water occurring more or less in consonance with the progression of the tide from the West, the second with an apparently counter tidal undulation from the eastward, the result being that near the eastern limit of this section a prolonged rise of tide is caused, which, in the Solent, develops into two distinct high waters with an interval of from one to two hours between them, and this interval increases progressively along the shore westward of the Needles to three and four hours, until, as Weymouth is approached, the double tide corresponding more closely with the time of low water becomes in fact a double low water, and is locally known as the "gulder."

Place.	High water, full and change	Rise Springs.	Rise Neaps.	Place.	High water, full and change	Rise Springs.	Rise Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Christchurch {	9 0 / 11 30	5		Padstow	5 13	20½	16¼
Needles Pt.	9 46	7½	5	Boscastle	5 15	22	17
Hurst, camber {	10 0 / noon	7½	6	Budehaven	5 45	23	17
Yarmouth {	10 0 / noon	7	5½	Lundy I.	5 15	27	20
				Appledore	5 58	23	16½
Cowes {	10 15 / 11 15	12½	9½	Bideford	6 7	16	
Lymington {	10 25 / 0 15	8	6	Barnstaple, bridge	6 28	10½	
				Ilfracombe	5 42	27¼	21¼
Beaulieu {	10 25 / 0 15	10	8½	Lynmouth, or the Foreland	6 2	30½	21¾
Calshot (Castle Pt.)	11 30	14	11¼	Minehead	6 24	32¼	24½
				Bridgewater bar	6 50	35	26½
Hythe pier {	11 10 / 0 52	13¾	9¾	„ town	8 0	18	
				Weston-super-mare	6 54	37	28½
Southampton {	10 30 / 0 45	13	9½	Flatholm I.	6 56	37¾	29
„ Red-bridge {	10 42 / 0 57	8½	6	Walton B.	7 3	39¾	30
				Portishead	7 11	42	31
Portsmouth Dock-yard	11 41	13½	10¾	Bristol, Cumberland dock gates	7 13	31½	
„ Portchester, off the castle	11 45	13½	10¼	Sharpness	7 58?	28?	15?
				Gloucester	9 45?	4-7	
„ Ports bridge, west of bridge	11 48	6½‡	4‡	Chepstow	7 30	38	28½
				Newport	7 10	38	29
„ Fareham, close to Upper quay	11 48	11¼	8¼	Cardiff, Bute dock	7 0	36¼	27
				Barry I.	6 38	37½	28½
„ Fareham bridge	11 51	7½	4¾	Nash Pt.	6 25	33	25
Langston Hr.	11 40	13½	10½	Porthcawl	6 8	28½	21¼
Ryde	11 20	13½	10	Neath	6 16	13½	
Bembridge Pt.	11 0	14	10½	Swansea, Mumbles Lt. Ho.	6 0	27¼	20¼
Chichester	11 30	14	11	Worms Hd.	6 1	25¼	18½
Selsea bill	11 45	16¼	12½	Burry, P.	6 3	26	19
Pagham	11 30	16½	12½	Llanelly, bar	6 16	25	18½
Littlehampton bar	11 20	16	11½	Carmarthen bar	5 44	26	19½
Arundel	0 25	10	7	Ferryside	5 49	23	16¼
Shoreham	11 34	18	13½	Carmarthen	6 10	8½	
Brighton	11 15	19¾	16	Tenby	5 38	25½	19¾
Newhaven	11 14	19	14	Caldy Rd.	5 37	25½	19¼
Beachy Hd.	11 20	20	15	Milford (St. Ann's) Lt. Ho.	6 6	21¾	16½
Hastings	10 53	24	17½	Pembroke Dk. yard	6 12	22½	17
Rye B.	11 20	22	17½	Laurenny	6 23	20	14½
Dungeness	10 45	21¾	19	Landshipping	6 27	20	14½
Folkestone	11 7	20	16½	Little Milford quay	6 31	19	13½
Dover	11 12	18¾	15	Haverfordwest	6 42	7½	2½
Deal	11 15	16	12½	Smalls Lt. Ho.	6 0	21	
Ramsgate	11 44	15	12	Ramsey Sd.	6 0	17	
				Fishguard	6 56	12¼	9¼
England, West coast.				Newport	7 0	12	9
Scilly Is. (St. Agnes)	4 30	16	12	Cardigan	7 1	12	9
Cape Cornwall	4 35	18?	13?	New quay	7 30	13	
St. Ives	4 44	21	15	Aberystwith	7 37	14½	10
Towan or New Quay	4 42	21½	15¾	Aberdovey	7 57	14¼	10
Padstow B.	4 40	22	16	Sarn-y-bwch Rf.	7 40	14	
				Barmouth	7 46	14¼	10½
				Sarn Badrig	7 30	13	
				Port Madoc (bar)	7 35	16½	10¾
				Pwllheli (bar)	7 51	14¾	10½
				St. Tudwall Rd.	7 44	14	10½
				Bardsey Id.	7 40	15	

‡ Above the bed of the lake.

Place.	High water, full and change.	Rise		Place.	High water, full and change.	Rise	
		Springs.	Neaps.			Springs.	Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Porth Dinlleyn	8 40	12¼	9¾	Lamlash	11 49	10	7
Llanddwyn I.	8 58	14¼	10½	Ayr	11 50	8¾	7¼
Belan Pt.	9 14	13½	10¼	Troon	11 50	10	7½
Carnarvon	9 30	15½	12	Ardrossan	11 49	10	7½
Port Dinorwic	9 35	18	13½	Garroch Hd.	11 49	10	
Pwllfanog	9 40	19	14¼	Millport, Great Cumbrae	11 50	10	6
The Swellies	10 24	22¾	16	Largs	11 50	10	
Beaumaris	10 30	23¼	16½	Greenock	0 8	10	8¼
Holyhead	10 11	16	12¾	Dumbarton	0 20	10¼	
Amlwch	10 15	20	15½	Bowling	0 30	9¾	
Trwyn Du	10 28	22	16¾	Renfrew, canal ent.	0 50	11	
Air Point, R. Dee	10 54	25	19	Glasgow	1 8	11¼	9½
Chester, Crane wharf	0 16	10		Loch Long	0 6	12	
Helbre I.	11 0	26½	22	„ Goil	0 6	10	6
Liverpool	11 23	27½	20¼	„ Strivan	11 55	6	
„ N.W. L.V.	11 0	25	20	Burnt Is., Kyles of Bute	11 50	10	8
Formby Pt.	10 35	25¼	19	Skip ness	11 50	9	6
Ribble Lt. Ho.	10 51	25¼	19	East Loch Tarbert, Argyleshire	11 53	9	
Preston*	11 20	17	10	Ardrishaig, L. Fyne	11 53	9	7½
Fleetwood (Wyre Lt. Ho.)	11 11	27½	20½	Inverary	noon.	10	
———— P.	11 12	27	20½	Campbelton	11 45	8¾	6
Glasson Dk.	11 16	20	14	Mull of Cantyre	10 35	4	
Lancaster	11 16	8½	2	Gigha Sd.	2 22	4	2½
Morecambe	11 26	27	21	West Loch Tarbert, Argyleshire	2 30	1-4	
Piel Hr., P. of Barrow	11 5	28	21	Port Ellen, Islay	5 0	5	4
Tarn Pt.	11 22	23	18	Noamh I.	5 2	11½	7
Whitehaven	11 14	26	19	Colonsay (Schalla-saig)	5 18	11	7½
Port Harrington	11 15	25	19	Jura, Feolin ferry	4 41	6½	4½
Workington	11 4	25½	20	„ Small Is.	5 3	3½	2½
Maryport	11 26	25	19	Crinan	4 49	6	3-4
Silloth	11 40	26	20	Carsaig, Mull I.	5 28	10	7½
Port Carlisle	0 10	20	14	Easdale Sd.	5 10	10-12	
Ayre Pt., I. of Man	11 7	20 ?	16 ?	Ardintallan L. Feochan	5 31	9	6½
Peel, „	11 8	16¼	13	Oban	5 28	13	9½
Calf Sd., „	11 17	16¼	13	Stonefield, L. Etive	7 3		
Port St. Mary, „	11 10	20	16	Bunawe „	7 54	5¾	
Castletown, „	11 10	20	16	Port Appin, L. Linnhe	5 26	12¼	8½
Douglas, „	11 12	20¾	16	Ballachulish, L. Loven	5 43	11	
Ramsey, „	11 12	20¾	16	Loch Leven, Hd. of loch	6 28		
				Corran, L. Linnhe	5 43	12	8¼
				Corpach	5 59	11½	
Scotland, West coast.				Loch Eil (Hd. of loch)	6 27		
Annan Foot	0 5	28½	20	Duart, I. of Mull	5 0	12	10
Dumfries	noon.	6		Loch Aline	5 33	13¼	10½
Southerness	11 50	27½	19½	Tobermory, I. of Mull	5 36	13	9½
Abbey Hd.	11 10	25	18½	Loch Cuan „	5 36	13	9½
Kirkcudbright	11 10	23	17	Strontian, L. Sunart	5 40	13½	
Newton Stewart	noon.	12	6	Iona Sd.	5 11	11¾	8¾
Wigton	11 30			Bunessan	5 24	12	8¼
Garliestown	11 20	21	16	Loch Tuadh, Gometra, I. of Mull	5 29	11¾	8
Port William	11 10	18	14				
Mull of Galloway	11 15	15 ?	12 ?				
Port Patrick	11 10	15	12				
Loch Ryan	11 12	11	8				

* Low water at Preston is the same at springs and neaps, and is represented as 10 feet on the Ribble Navigation gauge. This datum is 2·37 feet below Ordnance datum, and 10 feet above the low water level in the estuary.

Place.	High water, full and change.	Rise.		Place.	High water, full and change.	Rise.	
		Springs.	Neaps.			Springs.	Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Heynish, Tiree I.	5 30	12	6	Cape Wrath	7 30	15½	
Scarnish, Tiree I.	5 31	12	9	Loch Eriboll	7 43	14¾	11
Arinagour, Coll I.	5 41	12¼	9½	,, Tongue	7 53	15	12
Loch Moidart	5 44	13½	9¼	Thurso	8 28	13¼	9¼
Eigg I.	6 15	14	11	Stroma, S. side	9 47	9	6¼
Canna I.	6 19	14	9½	Swona, E. side.	10 24	10	7½
Arasaig	5 50	13½	10	,, W. side	9 35	10	7
Loch Nevis	5 47	14½	10	Great Skerry, E. side	11 4	7¾	6½
,, Hourn	5 45	13¾	10½	,, ,, W. side	10 53		
Ornsay, I. of Skye	5 50	14½	10½				
Kyle Rhea	6 0	15	11				
Loch Duich	6 0	15½	11				
,, Alsh, Kyle Akin	6 16	15½	11	*Orkneys.*			
Loch Carron, Plock-ton	6 29	16½	11½	Widewall, South Ronaldsay	9 3	10	7½
Portree, I. of Skye	6 32	15	10¾	Stromness, Mainland	9 0	10	7½
South Rona, Lt. Ho.	6 20	14½	10½	Scapa, Mainland	9 5	10	7½
Loch Torridon	6 20	15	11	Deer Sd., Mainland	10 30	10	7½
Barra, Hd., Bernera I.	5 45	11¼	7	Kirkwall ,,	10 20	8½	6¼
,, Castle B.	5 44	11¾	8½	Westness, Rousay	9 11	10	7½
,, North Hr.	5 48	11½	8½	Otterswick, Sanday	9 13	11	8
Loch Boisdale, S. Uist	5 47	12¾	9½				
Loch Eynort, S. Uist	6 0	12		*Shetland isles.*			
Benbecula	6 3	11½	8½				
Loch Skiport	5 52	12½	9	Fair isle	11 0	5	3
,, Harport, I. of Skye	5 54	13¾	10	Sumburgh Hd.	9 45		
,, Dunvegan, I. of Skye	6 7	15¼	11	Scalloway ,,	9 30	5¾	4½
,, Snizort, I. of Skye	6 8	14½	10	Hillswick ,,	9 45	6½	5
Kallin, North Uist	5 59	13¼	9½	Lerwick, B. of Heogan	11 5	5¾	4½
Monach Is., Shillay	5 44	12½	8¼	Balta, Unst	9 45	6½	4½
Loch Eport, N. Uist	6 6	12½	9¼				
,, Maddy ,,	6 6	12½	9¼	*Scotland, East coast.*			
Vallay ,, ,,	6 10	11¼	8½				
Berneray, I. Sd. of Harris	6 11	13	9½	Duncansby ness	10 14	10	7
Obb of Harris	6 16	11½	8½	Wick	11 22	10	7½
East Loch Tarbert, Harris I.	6 10	13½	10	Loch Fleet	noon.	10¾	
				Dornoch Rd.	noon.	11	
W. Loch Tarbert	6 4	11¾	8½	Bonar bridge	0 34	6½	
Loch Seaforth, Athline	6 16	15	10	Cromarty	11 56	14	11
				Dingwall	11 39	13	9¾
,, Clay	6 9	14¾	9½	Inverness.	0 18	12	9½
,, Ewe, Poolewe	6 39	14½	10½	Banff	0 28	10½	8
Gruinard I.	6 37	14½		Fraserburgh	0 40	11	8½
L. Broom, Ullapool	6 40	14½	10½	Peterhead	0 34	11½	9¼
Tanera, Summer I.	6 37	14	10½	Ythan R.		9½	
Loch Inver	6 40	14	11	Aberdeen	1 0	12	10
,, Laxford	6 44	15	11¾	Stonehaven	1 10	14	11
,, Erisort, Lewis I.	6 43	15¼	11¼	Montrose	2 17	14	11
				Arbroath	1 35	14	11
				Tay R., bar	2 6	16	13½
Stornoway ,,	6 46	13½	9½	Broughty ferry	2 22	14½	11
Loch Roag, Bernera, Lewis I.	6 11	11	8	Dundee	2 32	14½	11½
				Perth	3 35	9½	
St. Kilda	5 30			Fife ness	2 10	15	12
Rockall	3 30	12		Burntisland	2 24	16½	12¾

Place.	High water, full and change.	Rise.		Place.	High water, full and change.	Rise.	
		Springs.	Neaps.			Springs.	Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Queensferry	2 37	18	14	Cley	7 0	5½	
Kincardine	2 53	17¾	15	Cromer	7 0	14¾	11
Alloa	3 18	17½	15	Leman and Ower }	7 15.	9	
Stirling	3 52	7½	4	L. V. . }			
Granton pier	2 20	16½	12¾	Hammond knoll	7 40		
Leith	2 17	16½	12¾	Winterton ness	8 25	7¾	6¼
Cockenzie, firth of }	2 16	15¾	13	Yarmouth Rd. .	9 15	6	4½
Forth . }				,, haven, Brush		6	4½
Dunbar	2 8	14½	11	,, bridge.		5	4
Eyemouth	2 15	15?	11?	*Lowestoft	9 57	6½	5¼
Berwick .	2 18	15	11½	Blyth R., Southwold	10 20	6½	4½
				Aldborough	10 45	8?	6½?
				Orfordness	11 15	8	6½
				Hollesley .	11 30	8?	6½
England. East coast.				Orford haven bar	11 30	7½	
				,, quay .	0 30	7½	
Holy Island Hr.	2 30	15	11½	,, Slaughden .	1 0	7½	
North Sunderland	2 30	15	11½	,, Snape bridge	3 0	6	
Coquet Rd.	3 0	14½	11	Woodbridge haven }	11 45	11	8
Blyth	3 15	15	11	bar . }			
Tyne R. entrance	3 18	15¼	10¾	,, Kingston quay	0 35	10	
,, North Shields .	3 21	14¾	11	,, Wilford bridge	0 55	7	
,, Howden .	3 23	15	11½	Harwich Hr. .	0 6	11½	9¾
,, Walker .	3 26	15½	11½	Orwell R., Pinmill .	0 20	12	
,, Newcastle	3 32	15½	11¾	,, Downham }	0 27	12	
Sunderland	3 22	14½	11	reach . }			
Seaham	3 24	14½	10½	,, Ipswich	0 35	13½	
Hartlepool	3 28	15	11¾	Stour R., Wrabness .	0 29	12	
Tees R., bar	3 45	15	12¼	Stour R., Mistley }	0 48	11¾	
,, Middlesborough	3 47	17	12¼	quay }			
,, Stockton .	4 40	11		,, Cattawade }	1 8	4¼	
Whitby .	3 45	15	11½	bridge }			
Scarborough	4 11	15¾	12½	The Naze .	11 50	12½	10
Filey B. .	4 16	15½	12¾	Colne R., entr.	11 55	14	10
Flamborough Hd.	4 30	16	12	,, Wivenhoe	0 10	15	10
Bridlington	4 39	16	12	Blackwater, R., }	noon.	14¾	10
Humber R., Spurn }	5 26	18¾	15	Scales Pt. }			
Pt. . }				,, Heybridge	0 20	12	8
,, Grimsby	5 36	19¼	15¼	Chelmer R., Mal- }	0 32	10	6
,, Killingholme .	6 2	19¾	15¾	don . }			
,, Hull	6 29	20¾	16¼	Gunfleet sand .	11 50	12	8
,, Ferriby sluice.	6 41	20¼		Long sand	11 50	12	8
,, Blacktoft	6 59	16		Kentish Knock	11 47		
,, Goole	7 26	13		Crouch R., Foulness	0 5	14½	10½
Boston deep, Clay }	6 0	22	15½	,, Hull bridge	0 25	.16	11
hole . }				Maplin Lt. Ho.	0 5	14	10
,, dock .	6 30	21	14½	Nore	0 30	15½	13
Fossdyke bridge		12		Gravesend	1 5	18½	15
Lynn deep, Long }	6 0	23	16½	Woolwich	1 37	18½	15½
sand . }				Greenwich	1 43	19	15
Sutton bridge .		20½		London docks .	1 53	·20¾	17¼
Wisbeach	7 30	15¼		,, bridge .	1 58	20¾	17½
Lynn Rd.		23½		Sheerness	0 37	16	13¼
,, Lynn		22½		Chatham .	0 43	18½	14½
Outer Dowsing Sh. .	6 10	15	11	Pansand hole .	noon.	15½	13
Wells bar	6 20	18		Margate .	11 45	15½	13
Wells	7 0	12					
Blakeney bar	6 30	15					
Blakeney		9					

* It has been observed that heavy southerly gales reduce the depth of water 2 or 3 feet below that shown in the Barnard and Pakefield channels.

Place.	High water, full and change	Rise. Springs.	Rise. Neaps.
Ireland, South and East coasts.			
	h. m.	ft.	ft.
Cape Clear	4 0	9	6½
Baltimore	4 23	10½	8¼
Castletownsend	4 21	10¾	8
Clonakilty B.	4 30	11	8½
Courtmacsherry	4 36	10¾	8½
Kinsale	4 43	11½	9
Queenstown	5 1	11¾	9
Cork	4 58	12½	10
Ballycottin	4 54	12	9½
Youghal	5 14	12¾	10
Ballinacourty, Dungarvan	5 12	12½	9½
Dunmore	5 27	12¼	9¾
Waterford, Duncannon fort	5 20	12½	10
" bridge	6 6	13½	10¾
New Ross	6 4	12½	10
Saltees	5 40	13	10
Carnsore	6 0	9	
Tuskar	5 45	9	
Wexford South B.	5 40	6	4
Rosslare Pt.	6 30	5	3½
Wexford	7 21	5	3½
Polldulf	7 0	4	2½
Courtown		3½	2
Kilmichael Pt.	8 0	4½	2¼
Arklow	8 0	4	2¾
Arklow Bk.	8 0	3½	3
Wicklow	10 29	9	6½
Bray Hd.	10 45	12	9½
Dalkey I.	10 45	13	11
Kingstown	11 12	11½	8¾
Dublin, Poolbeg Lt. Ho.	11 12	12–14	9–11
North Wall basin	11 32		
Howth Hr.	11 9	13	10
Malahide inlet	11 15	10	8
Rogerstown inlet	11 15	10	8
Skerries Is.	11 0	13	10
Balbriggan	10 40	13	
Drogheda, Crook Pt.	11 0	11¾	9
Dundalk	10 56	15	11½
Carlingford (bar) or Cranfield Pt.	11 0	16	11
" Warren Pt.	11 10	14½	12
" Victoria lock, Newry R.	11 43	13½	10¾
Newcastle	11 4	14¾	12
Ardglass	11 0	16	12
Lough Strangford (Killard Pt.)	10 53	14	11½
" Strangford quay	0 31	10½	8¾
" Quoile quay	0 45	11	9½
" Kircubbin	0 42	11½	9½
" Killyleagh	0 40	11	9½
Head of the lough (Turley Rks.)	0 44	11½	9½

Place.	High water, full and change	Rise. Springs.	Rise. Neaps.
Ireland, West coast.			
	h. m.	ft.	ft.
Cape Clear	4 0	9	6½
Skull	4 2	9¾	7½
Crookhaven	4 0	9¾	8
Dunmanus Hr.	3 57	9½	7¼
Dunbeacon	3 51	10½	7¼
Bantry Hr.	3 47	10	7½
Castletown, Bearhaven	4 14	9¾	7½
Black Ball Hr.	3 40	9½	7¼
Kenmare R., Ballycrovane	3 42	10½	7¾
" Ormond	3 43	10	7½
" Dunkerron	3 45	10½	8
" West cove	3 52	10	7½
Ballinskellig B.	3 40	12	7¼
Valentia Hr.	3 42	11	8
Castlemaine	4 30	14½	9½
Dingle	3 51	10¾	7¾
Ventry	3 44	10½	7¾
Blasket Is.	3 30	11¾	8
Smerwick	3 50	11½	8
Tralee B., Fenit	4 3	12½	9¼
R. Shannon, Kilbaha	4 16	13	9½
" Carrigaholt	4 44	14	10¼
" Kilrush	4 42	14	10½
" Tarbert	4 57	11½	10½
" Foynes I.	5 35	15½	12
" Beagh quay	5 49	18	13
" Mellon	6 1	18½	13¾
" Limerick	6 10	18¾	13½
Mutton I.	4 20	13¾	9½
Liscanor B.	4 23	13½	10
Galway	4 35	14½	11
Killeany, Arran Is.	4 28	13½	10
Cashla B.	4 33	16	12
Greatman B.	4 39	15½	11½
Kilkieran cove	4 34	15½	11
Roundstone	4 28	13½	10¼
Slyne Hd.	4 30	13½	10
Clifden B.	4 30	13½	10
Ballynakill B.	4 40	12½	9½
Killary B.	4 30	12½	9½
Inishbofin	4 34	12½	9½
Inishturk	4 36	12½	9½
Clare I.	4 38	12½	9½
Westport	4 57	12¾	9½
Achillbeg	5 14	10¾	8
Bulls mouth, N. entrance of Achill Sd.	5 38	10¾	7½
Blacksod B., quay	4 47	10	8½
Broadhaven Hr.	5 0	10½	7½
Killala B.	5 22	10½	8
Sligo B., Mullaghmore	5 18	11½	8½
Ballysadare, quay	6 0	8¾	5½
Sligo Hr., Oyster I.	5 23	11½	8½
Ballyshannon bar	5 18	11¼	8½

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Donegal Hr.	5 18	11½	8½
Killybegs	5 16	11¼	8½
Teelin Hr.	5 16	11¼	8½
Loughrosmore	5 20	11	8
Rutland I.	5 22	11	8
Gweedore, Bunbeg	5 32	11	8

Ireland, North and East coasts.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
Ballyness bar	5 22	11½	8½
Sheephaven	5 32	11½	8½
Mulroy E., bar	5 40	11½	8½
,, Fanny hole	6 17	9½	8
,, Seamount B.	6 44	7½	
,, Cranford B.	8 3	4	2½
Rathmullan, lough Swilly	5 42	12½	9
Trawbreaga lough	6 10	11½	8½
Slievebane B.	5 49	10½	7½
Culdaff B.	5 53	8½	6
Warren Pt., lough Foyle	6 20	6½	5
Moville, l. Foyle	7 6	7½	5½
Londonderry	8 1	7¾	5½
Coleraine	6 24	6½	4
Port Rush	6 8	5½	3½
Skerries	6 15	5	3
Ballycastle B.	6 25	3	2
Red B. pier	10 31	4	4
Cairnlough	10 51	5½	5
Maiden Rks.	10 43	6¾	6½
Lough Larne	10 48	6¾	6¼
Belfast	10 43	9½	8
Donaghadee	11 13	11¼	9½
South Rk.	10 58	13	10¾
Lough Strangford, Killard Pt.	10 53	14	11½

France, North coast, and Channel islands.*

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
Ushant	3 46	19½	13¾
Abervrach	4 14	22	16
Ile de Bas	4 52	23	17
Roscoff	4 52	23	17
Morlaix Rd.	4 53	24	18
Ploumanach	5 15	24½	18½
Plougrescau	5 17	25½	18¾
Tréguier	5 32	23	18½
Héaux Lt. Ho.	5 45	31	23½
Bréhat	5 51	31	23½
Lézardrieux	5 53	32¾	23¼
Painpol	6 0	31	23½
Portrieux	6 0	31	23½
Binnic	6 3	30	22½

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Dahouet	6 5	32	23½
Erqui	5 59	33½	24½
St. Malo	6 5	36¼	25¾
Cancale	6 20	37	27
Les Minquiers	6 6	35	26
Iles de Chausey	6 14	35	26
Granville	6 9	37	27¼
Régneville	6 20	35	26
St. Germain	6 20	34	25
Carteret	6 25	31	22½
Ecrehos Rks.	6 32	31	22½
Jersey, Rozel	6 15	30	21½
,, St. Helier	6 29	31½	23
Guernsey, St. Peter P.	6 37	26	18¾
Casquets	6 45	15½	
Alderney	6 46	17½	12¾
Diélette	6 40	27	20¾
Goury	7 8	22	17½
Omonville	7 29	15¼	12½
Cherbourg	8 0	17¾	13¾
Barfleur	8 59	18	13½
La Hougue	8 53	19	14½
Port-en-Bessin	8 57	20	15½
Coursoulles	9 7	19	15
Oystreham	9 59	19	15
Caen	10 57		
Merville	9 45	21	17½
Dives	9 39	21	16
Houfleur	9 29	23	18
Quilleboeuf	10 6	9½	7½
Rouen	2 28		
Havre†	9 18	22	18
Fécamp	10 47	23½	18
St. Valery-en-Caux	10 46	27	21½
Dieppe	11 8	27½	21
Tréport	11 12	28½	22
Cayeux	11 14	28½	22
Hourdel	11 30	28½	22
St. Valery-sur-Somme	11 48	28½	22
Boulogne	11 28	25½	19¾
Cape Grisnez	11 27	21½	16¾
Calais	11 49	21	17½
Gravelines	noon.	19	15¾
Dunkerque	0 8	16¾	13¼

* On the north coast of France equinoctial springs, to which the soundings on the charts are reduced, fall 2 to 4 feet below ordinary springs, the latter being those given in the Tide Tables.

† At Havre, on the French coast, the high water remains stationary for one hour, with a rise and fall of 3 or 4 inches for another hour, and only rises and falls 13 inches for the space of 8 hours; this long period of nearly slack water is very valuable to the traffic of the port, and allows from 15 to 16 vessels to enter or leave the docks on the same tide.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.

North Sea, East shore.

Place.	High water full and change. h. m.	Springs. ft.	Neaps. ft.
Nienport	0 18	16	13
Ostende	0 25	17	13
Blankenberghe	0 15	13	10
Sluissche-gat	0 50	14¾	10
Flushing	0 54	15	11
Neuzen or Terneuse	1 35	15	11
Bath	3 15	14	
Liefkenshoek	3 25	16½	11½
Antwerp	4 25	15	
Veere gat	1 0	15	11
West-kappelle	0 40	14¾	11
De Roompot, Onrust	1 0	15	11
Zierikzee	2 0	10½	9
Brouwershaven gat	1 0	9¼	7½
Brouwershaven	2 0	10	8
Bruinisse	2 30	11	
Willemstad	3 30	10	
Moerdijk	4 0	9	
Goeree gat*	2 0	7½	
Hellevoetsluis	2 30	5½	
Brielle	3 0	5	
Rotterdam	3 45	7	
Katwyk	2 30	5	
Ymuiden†	3 0	5⅞	
Texel, bar	6 0	4¼	3¼
Willemsoord Rd.	7 25	4½	3¾
Nieuwediep	7 27	4	
Harlingen	9 0	5¼	
Terschelling, West	8 40	6	
Ameland	9 30	6¼	
Schiermonnikoog	9 40	5¾	
Rottum	10 0	7¼	
Borkum, West	10 30	7	
" East	10 30	7	
Delfzyl	11 15	10	
Emden	0 34	9	
Juist	10 15	6½	
Norderney	11 15	7¾	
Baltrum	11 20	8	
Langeoog	11 35	8	
Spiekeroog	11 32	8½	
Neuharrlingersiel	11 55	5½	
Frederikensiel	11 55	4	
Wangeroog	11 37	8¼	
Hooksiel	noon.	11	
Wilhelmshaven	0 52	11⅛	
Weser entrance	11 30	14	
Weser L.-V.	0 20	9⅝	
Hohe Weg Lt. Ho.	0 35	10½	
Bremerhaven	1 4	10¾	
Heligoland	11 48	9	
Elbe, entrance	noon.	11	6
Elbe, Outer L.-V., No.1.	0 15	9¼	
Cuxhaven	0 40	10¼	7¾

Place.	High water, full and change. h. m.	Springs. ft.	Neaps. ft.
Brunsbüttel	1 53	9¾	
Gluckstadt	2 52	10⅛	
Hamburg	5 10	6½	5½
Busum	1 21	12	
Blauort sand	0 38	12	
Eider R., entrance	noon.	10	
" Tonning	1 55	11½	
Husum	2 20	11	
Pellworm	1 50	10	
Amrum	0 36	9	
Wyk, Fohr I.	1 50	8	
Lister deep, fair-way buoy	0 30	5	
" Rd.	2 0	6½	
Sönderho, Fano	2 22	5½	
Gras deep bar	2 32	5	
Hjerting	2 45	4¾	
Blaavand Pt.	1 44	7	5
Horn Rfs.	noon.		
Nyminde Gab	2 45	2½	
Torsminde	3 34	2	
Thybö Rön	4 9	2	
Hirtshals	4 28	1	
Skagen or the Skaw	5 56	1	

Norway.

Place.	High water. h. m.	Springs. ft.	Neaps. ft.
Christiania	5 34	1½	
Bergen	10 25	4	
Romsdals Is.	10 45	6	
Ramso fiord	10 58	6-7	
Troudhjem B.	11 12	8-9	
Oxbaasheia, Svee fiord	noon.	8	
Traen Is.	11 45	7	
Værö	noon.	9	7½
Lofoten Is.	0 31	9½	7½
Tromsö	1 14	8	
Hammerfest	1 10	9	7½
Vadsö	6 30	6-8	

Fœroe Islands.

Place.	High water. h. m.	Springs. ft.	Neaps. ft.
Fuglofjord	11 15	6½	4½
Lervigsfjord	0 30	6½	4½
Naalsofjord	4 0	6½	4½
Skaapenfjord (between Hesto and Sando)	5 30	9½	7½

* At Goeree gat the flood tide runs longer and rises higher with northerly and westerly winds, while southerly and easterly winds equally affect the ebb.
† During heavy gales, the tide sometimes rises 9 to 10 feet.

Place.	High water, full and change.	Rise Springs.	Neaps.	Place.	High water, full and change.	Rise Springs.	Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Vaagofjord	6 0	9½	7½	Keret, G. of Kandalak	3 8	6	
Myggenæsfjord	9 0	9½	7½	Kovda B.	3 25	6	
Vestmanhavn	8 0	9¼	7½	Kandalaksha	3 25	7	
Eidefjord	11 0	9½	7¼	Sosnovaia	2 40	6	
Trangjisvaag, Sudero	6 2	4	7	Kou Zomen	3 30	6	
				Tetrina	3 17	7	

Iceland.   *Spitzbergen, &c.*

Place.	High water, full and change.	Rise Springs.	Neaps.	Place.	High water, full and change.	Rise Springs.	Neaps.
Westmanoerne	4 50	11		Bell (Bel) Sd.	1 6	7	
Reykjavik	5 21	14½		Advent anch.	0 45	6	
Grundar fiord	4 45	14½		Danes Id., South Gat	0 24	5½	
Stykkisholm	5 45	12	6¼	Novaia Zemlia, W.C.		3?	
Öe fiord	9 50			Golchika, Yenisei R.	6 0	1½	1
Dyra fiord	6 30	9-10	5-6				
Hesteyre fiord	7 10?						
Vapna fiord	12 0						
Seidis fiord	1 20	9					
Eske fiord	1 30	9	5				
Bern fiord	3 10	7	3				

Lapland.   *Europe, West coast.*

Place.	High water, full and change.	Rise Springs.	Neaps.	Place.	High water, full and change.	Rise Springs.	Neaps.
Novaia Zemlia Hr.	6 36	10		Gibraltar, new mole	1 47	3½	2½
Kildin I.	6 45	12		Algeciras	1 49	4	2½
Teriberskoi B.	7 20	13		Tarifa	1 46	6	3½
Oleni Rd.	7 30	12		Conil	1 18	12	7½
Sem (Seven) Is.	8 20	12		Cadiz	1 56	12	9
Sriatoi Nos	9 20	14		Rota	1 24	12½	8
				Salmedina Rks.	1 27	12½	8
				Bonanza	2 0	12½	8
				Port of Huelva	1 54	14	
				Guadiana R.	1 57	12	
				Lagos	2 7	13	
				Setubal	2 30	11½	7
				Cascaes B.	1 51	10½	
				Lisbon (Belem)	2 15	12	9
				Peniche	1 54		

White sea.

Place.	High water, full and change.	Rise Springs.	Neaps.	Place.	High water, full and change.	Rise Springs.	Neaps.
Turna B.	9 54	11		Mondego (bar), Figueira	2 30	7	
Trek I.	10 48	20		Oporto	2 30	10	8
Litke ledge	11 45	15		Miño R.	2 30	7	
Cape Kanushin	11 54	15		Vigo	3 0	12-13	
Sosnovets	11 44	18		Arosa B.	3 0	11	7½
Morjovets I.	11 20	17		Cape Finisterre	3 0		
Cape Voronov	11 20	17		Port Camariñas	3 0	15	
Kouloi R.	1 15	20		Coruña	3 0	15	
Mezen	2 8	20		Ferrol	3 0	13?	9½
Intsi Pt.	11 55	16		Cedeira	3 0	15	
Kerets Pt., G. of Arkhangel	4 30	5½		Vivero	3 0	15	
Nikolskoi	6 0	2		Rivadeo	3 0	15	
Moudiuga I.	5 50	3½		Aviles R.	3 0	12	
Drina bar	5 50	3½		Gijon B.	3 0	14	11
Arkhaugel	7 28	2½		Barquera, entrance	3 15	10¾	
Nikolskoi Chan.	5 25	3		Comillas	3 0	12	
Gribauika Pt.	4 50	3		St. Martin de la Arena	3 0	12	
Jijginsk I.	5 15	4		Santander	3 30	15	12
Cape Orlov Letni, G. of Onega	5 18	4		Sautoña	3 0	12½	10½
Onega R. Eutr.*	9 12	9½	7½	Port Castro Urdiales	3 0	12	
Souna	6 30	5½		Bilbao (bar)	3 0	13	
Kyem R.	5 23	4		,, (town)	3 20	9	
Solovets Rd.	5 55	4?		Bermeo	3 0	10¾	
Kalgalaksa	6 50	7		Lequeitio	3 0	10¾	8
				San Sebastian	3 0	12	9
				Port Pasages	3 20	11	9

* Northerly and westerly winds increase the tidal range, winds from opposite directions decrease it.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Socoa	3 19	12¼	8
St. Jean de Luz	3 6	13	9¼
Boucaut, Adour R.	3 53	8¼	5¼
Arcachon entr.	4 10	12¾	9¼
Cordouan Lt. Ho.	3 55	16¾	10¾
Royan	3 58	16¾	10¾
Pauillac	5 20	18¼	11¼
Bordeaux	6 50	15¼	12
Pertuis de Maumusson	3 35	13¼	10
Ile d'Aix, Charente R. entrance	3 35	16¼	13
Seudre R. entrance	3 35	13¼	10
Rochefort	4 0	16¾	13
Rochelle	3 31	16¼	11¼
Les Sables d'Olonne	3 37	12¾	9¼
Ile d'Yeu	3 28	14¾	10¾
,, de Noirmoutier	3 17	17	13
St. Nazaire	3 47	16¾	13¼
Port le Palais, Belle ile	3 38	16¾	12¾
,, Navalo	3 55	17	13
,, Louis	3 24	14	10½
Glenan Is.	3 12	14	10¾
Concarneau	3 12	14	10¾
Penmarch Rks	3 9	14½	10¾
Chaussée de Sein	3 21	17½	12
Brest	3 47	19¼	14¼
Conquet Rd.	3 44	19½	14¼
Ushant	3 46	19¼	13¾

Africa, West coast, with the Atlantic islands.

(From cape of Good Hope to the northward.)

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
Simons B.	2 44	5½	3½
Hout B.	2 20	5	
Table B.	2 40	5	3½
Saldanha B.	2 30	5	3½
St. Helena B.	2 30	6	
Roodewall B.	2 30	6¼	
Hondeklip B.	2 30	5½	
McDougall Hr.	2 30	5?	
Port Nolloth	2 35	5¼	3½
Elizabeth B.		5-6	
Angra Pequena	2 30	8	
Ichabo I.	1 0	6	4
Spencer B.	10 50	5-6	
Port d' Ilheo	3 0	8-10	
Walfisch B.	3 20	5¼	3¾
Great Fish B.	3 0	5	3¼
Port Alexander	3 0	5	
Little Fish B.	2 30	5-6?	
Benguela	3 0?	4½	3¼
Tristan da Cunha	noon.	4-6	
South Georgia, Moltke Hr.	7 20	2½?	

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
St. Helena	3 11	3	
Ascension	5 30	2	
St. Paul de Loando	3 48	4¾	
River Congo	4 30	6	
Loango B.	4 13	6½	
Mayumba	4 35	7	
Cape Lopez	4 30	4-6?	
River Gaboon, entr. Libreville	5 20	8	
Corisco B., Elobey Is.	5 0	7	
San Bento R.	4 30	4¾	2¼
Banoko	5 24	5	
Anno Bom I.	3 45	5	
San Thomé I.	3 25	4½	
Princes I.	3 58	3	1¼
Fernando Po	4 0	7	
Cameroon C.	5 30	6½	
Bimbia R.	5 8	6	
Old Calabar R.	6 30?	10?	6?
Kwoibo R.		6	
Opobo R.	4 30	7	5¼
Bonny and New Calabar rivers	4 50	6	4
Brass R.	4 30	6	4
River Niger, Nun entrance	4 15	5	3½
,, Middleton	4 15	5	
,, Pennington	4 15	5	
,, Dodo	4 17	5	
,, Ramos	4 20	5	
,, Forcados	4 22	5	
,, Benin	4 30	7	4½
,, Lagos, bar	5 0	3	2
,, ,, Consulate wharf		2	
Palaver Is.		1	
River Volta entr.*	4 20	4?	
Cape Coast castle	4 30	6	
St. George d'Elmina	4 30	6	
Cape Three points	4 0	4	
Axim	4 30	4	
Grand Lahu	4 20	4	
Tabu R.	4 45	3-4	
Cape Palmas	4 30	4	
Sinu	5 0	4	
Sangwin R.	5 15	4	
Sestos B.	5 20	4	
Edina	5 50	4	
Junk R.	5 45	5	
Monrovia	6 0	6	
Robert, port		3½?	

* In June.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Galliuas R.	6 45	4		Funchal B., Madeira	0 48	7	
Sherbro R., Buoy pt.	7 55	10½	7¾	Porto Santo B.	0 50	7	
" York I.	8 40	6	4	*Mediterranean.*			
Edmonstone I. "		8					
Dagru R.		11		Ceuta	2 6	3¾	2½
Banana Is.	7 18	10		Tetuan	2 23	2½	1½
				Malaga	2 30	3	
Sierra Leone	7 50	12½?		Tunis (Goletta)		3	
Yellaboi Sd.	7 10	10		Shebba		1	
Mellakori R.	7 40	11		Kerkenah Bks.	4 32	2	1½
Forikaria R.	7 40	11		Sfax Rd.	3 47	4½	2½
Manea R.	7 40	11		Surkenis B.	4 3	5½	3½
Isles do Los (Tumbo)	6 33	14	7	Jerba I.	4 23	5½	3½
River Ponga	7 30	12	9½	Zarzis	3 13	2½	1½
" Nunez	10 0	15	11½	Ras et Ketef	2 33	2½	
" Componi	10 0	15	11½	Tripoli	10 20	2	
Bijouga Is., Or- ango Chan.	10 0	11		Malta (Valetta Hr.)	3 30	1?	
" " Arkas Chan.	10 10	11-14	9	P. Augusta, Sicily	3 20?	½-1½	
" " Bissao.	11 0	8		Port Said	10 0?	½-1½	
River Cacheo	7 45	8		Yafa (Syria)	10 0	1½	
" Kasamanze	7 40	5½		Famagusta, Cyprus	10 0	1½	
" Gambia (Bathurst)	9 10	6½	5	Vromo passage, G. of Volo	9 30	2½	1¾
Kansala	0 5	6	3	Euripo	5 15	2	
Salum R.	8 10	6		Patras	4 54	2½	1½
Gorée	8 8	5		P. Galaxidi	5 0?	2½	1½
Senegal R., bar	8 42	6½		Aspra Spitia B.		2½	1½
" Guet N'dar	8 42	6½		Corinth canal, each end	5 0	¾	
" St. Louis	10 0	6½		P. Pandelemona	3 10	¾?	
Porto Grande, C. Verde Is.	6 0	3½		Dragamesti B.	3 10	¾	
Sal "	7 45	5		Lissa (Adriatic)	4 10	2½	
Mayo "	6 30	5		Port Sebenico "	6 26	1	
Porto Praya "	6 0?	5		" Lussin Piccolo "	8 26	1	
Tarrafal B., S. Antonio	7 0	5?		" Fiume "	8 30	1¼	
" B., S. Jago	7 23	5?		" Pola "	9 16	3½	
Fajao D'Agua, Brava	4 10	3½?		Trieste "	9 35	2	
				Port Malamocco "	10 30	2¼-4	
Portendick	10 0	6					
Levrier B.	noon.	6-7		*Falkland islands, East Falkland.*			
Cape Blanco	11 46	6					
Ouro R.	noon.	8-9		Port San Salvador	8 10	8	
Cape Bojador	noon.	8?		Berkeley Sd.	5 0	7	
" Juby	noon.	10?		Port William	5 30	7	5½
				Stanley Hr.	5 10?	7	5½
Ferro, Canary Is.	0 30?	9?		Port FitzRoy	4 45	6	
Palma "	0 30?	9?		" Pleasant	5 0	6½	
Gomera "	0 45?	9?		Island Hr.	5 20	6	
Santa Cruz, Tenerife	1 30	8	6	Mare Hr., Choi- seul Sd.	6 20	6	
Puerto de la Luz, Gran Canaria	0 52	10		Darwin Hr. "	6 30	5½	
Fuerteventura	1 0?	9?		Walker Cr. "	6 20	5½	
Lanzarote "	1 0?	8		Low B.	5 0	5½	
Santa Cruz or Agadir	0 45	9		Adventure Sd.	5 30	5½	
Mogador	1 18	10-12		Bull Rd., B. of Harbours	6 0	5	
Rabat	1 46	9-12		Falkland Sd., S. ent.	7 0		
El Araish	1 30	9-12		Ruggles B.	7 30	5	
Tangier	1 42	8½	5	Tyssen I.	8 0	6	
Fayal, Azores	11 45	4		Port King	8 30	5	
Terceira, Azores	0 32	4½		" Sussex	8 15	6	
St. Michael, Azores	0 30	6		" San Carlos	7 0	8	
				Falkland Sd. N. ent.	6 45		

Place.	High water, full and change.	Rise. Springs.	Neaps.	Place.	High water, full and change.	Rise. Springs.	Neaps.
					h. m.	ft.	ft.
				San Sebastian .	2 0	4	
				Ilha Grande B., }	1 45	5½	
West Falkland.				Paratio . }			
				Sapetiba B.	2 0	5½	
	h. m.	ft.	ft.				
Port Stephens .	7 45	7½		Rio Janeiro	3 0	4	3
„ Albemarle	7 15	7		Porto Frio	2 40	4½	
„ Edgar	7 15	6		Macahé .	2 30	9½	
Fox B. .	7 0	6		Benevente	3 0	5	
*P. Howard	7 0	5		Espirito Santo B., }	3 0	4	
Manybranch Hr.	7 40	7½		and P. Victoria }			
Port Egmont .	7 30	11		Abrolhos .	3 20	6–7	
Hope Hr. !	8 10	7		Martin Vas Rks.	3 45		
Shallow Hr.	9 30	6		Os Ilheos .	4 30		
Ship Hr., New I.	10 30	8		Camamu, P. of	4 0	6½	
				Bahia .	4 26	8	
				Maceio .	4 30	8½	
South America, East and North coasts.				Pernambuco	4 40	8	6
				Parahiba R. entr.	5 0	8	5½
(Cape Horn to the northward.)				Cape St. Roque	4 14	8–10	
Cape Horn .	3 40	9		Rocas .	5 15	10	
Le Maire Str. .	4 0	7		Fernando Noronha .	4 0	6 ?	
Staten I. .	4 30	8					
Cape San Diego .	4 30	10					
Cape Peñas .	6 42	12		Aracati .	6 0	8	6
San Sebastian B.	7 0			Ceara .	5 35	8¼	
Port Gallegos .	8 50	46		Jericoacoara .	5 15	8	6
Coy inlet .	9 30	40		Tutoia Anch. .	5 13	12¾	
Santa Cruz R.	9 30	40	29	Santa Anna Rfs. .	5 45	13	
Port San Julian	10 45	30		Maranham, San Luiz	7 0	16½	10¾
Sea Bear B.	0 45	20		Manoel Luiz Rf. .	5 0	12	
Port Desire .	0 10	18½		San Joao Is. .	6 24	14	
Tova I. .	3 45	18		Salinas R. .	7 30		
Port Sta. Elena	4 0	17		„ anchorage .	8 15		
†Cracker B. .	7 15	13 ?	10 ?	Para, Dentro Chan.	10 51	10	
Port Madryn .	7 15	13½	10	„ anchorage .	noon.	11	10½
„ San Josef	10 0	30	25	Conani R. .	6 38	19	
Port San Antonio	10 45	18–30		Cape Cachipour	5 52	7–10	
Rio Negro .	11 0	14	10	Cayenne R. .	4 37	5–7	
San Blas .	1 30	12	10	Salut Is. .	4 26	6–10	
Union B. .	3 10	12	9	Maroni R. .	5 0	9	6
Colorado R. .	4 0	9	7½	Surinam .	6 0	9–10	5–6
Port Belgrano .	6 0	16	13	Nickerie R. .	4 30	9½	
‡Rio de la Plata .				Cappename R. .	5 30	8	
C. San Antonio	10 0	5½		Corentyn R. .	5 10	8½	5½
„ Sanboronbon B.	10 45	6		Berbice .	4 30	8–10	6
„ Indio Pt. .		4		Demerara R. .	4 28	9	6
„ Barragan B. .	7 0	5–9		Orinoco R., entr.	6 0	3	
„ Buenos Aires .	6 0	3–5		Trinidad, Maracas B.	3 30	5	4
„ Monte Video .	2 30 ?	1½–5		„ Boca Mono .	3 50	4	2¼
„ Castillo B. .	8 30	2		„ Boca Grande	3 30	4	2¼
Rio Grande do Sul .		1½–2		„ Carenage .	4 20	4	2¼
Santa Catharina I. .	2 45	6	4½	„ port of Spain	4 30	4	3
Paranagua .	3 0 ?	6½		„ San Fernando	4 38	5	3

* In February, 1891 (moon's age 7ᵈ 4), the tide was observed to fall for about 2 hours, it then rose (about one foot) for 2 hours, and again fell quickly for about 2 hours.   H.M.S. *Cleopatra.*
† In April 1871, a rise of from 20 to 25 feet was observed in Nuevo gulf.
‡ After heavy gales from S.E. to S.W., the water in the Rio de la Plata may rise 8 feet above the soundings shown on the Admiralty Charts ; and continued winds from N.N.E. to N.N.W., may cause the water to fall to 4 feet less than the soundings.

Place.	High water, full and change.	Rise.		Place.	High water, full and change.	Rise.	
		Springs.	Neaps.			Springs.	Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Trinidad, Icacos Pt. .	4 14	7	4	Nassau . . .	7 30	4	3
„ Guaya-	4 25	7	4	Hanover Sd. .	8 15	4	3
guayare B. .				Salt Cay anchorage .	8 15	4	3
Carenero Hr. . .	10 0 ?	2 ?		Douglas road . .	8 30	4	2½
Maracaibo, G. of	5 15	2½		Royal island . .	7 45	3½	
Savanilla . . .		3 ?		Abaco . . .	8 0	3	
Cartagena . .	11 0	1½	1	Whale cay . .	8 0	4¼	
Caledonia Hr. . .	11 40	1½	1	Memory Rk. . .	7 50	3	
West India islands.							
Tobago . . .	3 0	4	2				
Grenada, St. George Hr. .	2 40	1½	¾	*(Haiti or St. Domingo.)*			
Grenadines . .	3 0	1½		Samaná B. . .	9 30 ?	3 ?	
St. Vincent, Kingstown	3 0	1½	1	Port Plata . .	7 30	3 ?	
Barbados, Carlisle B.	3 0	3	1½	Manzanillo B. . .	7 0	4–5 ?	
St. Lucia (P. Cas- tries) . .	2 36	2 ?		Fort Dauphin . .	7 0	5½	3½
Martinique, Fort Royal	4 0	1–1½		Cape Haiti . .	6 0	3	
La Trinité B. .		1½ ?		Acul Hr. . .	6 0 ?	3 ?	
Prince Rupert B. Dominica	1 30 ?	1½		Gonaives B. . .	8 0 ?	1 ?	
Roseau Rd., Dominica	1 30 ?	1½		Bay of St. Mark .	8 0 ?	1 ?	
Saintes . .	6 45			Port au Prince .	8 1 ?	1 ?	
Guadeloupe, Pointe à Pitre .	10 0	1¼		Caïmites . .	8 0 ?	1 ?	
English Hr., Antigua		2		Aux Cayes B. . .	irr.	2–3 ?	
Christianstæd. Santa Cruz .	7 30	¾		Flamand B. . .	„	2–3 ?	
Anegada . .	9 0	1½		St. Louis B. . .	„	2–3 ?	
Virgin Is., Gorda Sd. !	8 30	1½		Aquin B. . .	„	2–3 ?	
Tortola . .	8 30	1½		Jacmel . .	„	2–3 ?	
St. Thomas Hr. .	irr.	1		St. Domingo . .	„	2 ?	
Culebra or Pass- age I. . .	9 0	1					
San Juan, Puerto Rico	8 2	1½		*(Cuba.)*			
P. Ponce . .	2 0 ?	2 ?		Havana . . .	8 14	3	
Mona I. . .	6 20	2–4		Matanzas . .		2½	
(Bahamas.)				Piedras cay . .	8 0	2½	
Turks Is. .	7 40	3		Bahia de Cadiz cay .	9 20	3	
Inagua . .	8 0	3½	2	Cay Francés . .	6 0	2½ ?	
Miraporvos .	9 30	3	2¼	Port Cayo Moa .	8 9	2½	
Crooked I. .	7 0	2½		„ Taco .	8 49	2 ?	
Clarence Hr., Long I.	8 30	4	2½	„ Maravi .	7 56	2	
Exuma . .	7 20	2½		„ Baracoa .	7 23	2	
Wax cay Cut .	7 45	4½		„ Mata .	6 49	2½	
Bluff cay, Ship Ch. .	7 45	4½		„ Baitiquieri .	9 7	2¼	
Ragged I. .	8 0	3		Santiago de Cuba .	8 30	2	
Mucaras Rf. .	7 40	3		Manzanillo . .	10 40	4	
Lobos cay .	7 40	3		Santa Cruz .	noon.	4	
Guinchos cay .	7 40	3		Port Xagua .	4 57	2	
Anguila Is., Cay Sal Bk.	8 45	3½		Cape St. Antonio .		1½	
Gun cay . .	8 30	3		*(Jamaica.)*			
Stirrup cays .	7 0	4		Morant . .		½–1½	
S. W. bay .	7 30	4		Port Royal .	11 0	1	
				Dry Hr. . .	8 45	1	
				Pedro Bk. .	8 45 ?	1½	
				Grand Cayman .	9 25	1¾	

Place.	High water, full and change.	Rise.	
		Springs.	Neaps.
Bermuda.			
	h. m.	ft.	ft.
Ireland Id. dock-yard	7 14	3¾	2½
Central and North America, East coast. (Isthmus of Panama to the northward.)			
Colombia B.	0 20	1½	
Mandinga Hr.	0 50	¾	
Colon		1?	
Greytown (San Juan del Norte)	9 0?	¾-2	
Blewfield	1 50	2	
Corn Is.	1 45	2	
Colombilla cay, Pearl cays	2 0	2	
Cape Gracias Hr.	10 30	2	
Old Providence	irr.	1	
Serrana Bk.		2	
Serranilla Bk.	irr.	2	
Bonacca Id.	9 0	1½	
Royal Hr., Roatan	7 45	3½	
Belize		1½	
Cozumel	8 30	1½	
Mugueres Hr.	9 30	1½	
Cape Catoche	9 30	1½	
Sisal		2	
Cay Arenas	noon.	1½-2	
Campeche	1 45	2½	2
Triangles		1½	
Arcas cays	noon.	1½	
Laguna de Terminos	noon.	1½	
Coatzacoalcos R. ent.	irr.	1	
Vera Cruz		2-4	
Tampico	2 30?	2?	
*United States, South coast.**			
Brazos Santiago, entr.	irr.	½-1½	
San Luis pass, Texas.		1¾	¾
Galveston	irr.	1	
Sabine pass		1¾	
Calcasieu R.		2¼	1½
Vermilion B., entr.	irr.	2¼	1½
Atchafalaya B.	irr.	2½	1½
Timballier B.	irr.	2	
Barataria B.	irr.	1¼	
Mississippi, S.W. pass		1½?	
Biloxi	irr.	2	
Mobile	irr.	1-2	
Pensacola		1½	
St. Andrew B.	irr.	1-2	
St. George Sd., west entrance	irr.	2½-4	

Place.	High water, full and change.	Rise.	
		Springs.	Neaps.
	h. m.	ft.	ft.
St. George Sd., middle entrance	1 31	1¾	1¼
Apalachicola B.		2½-4	
St. Marks	1 14	3	2¼
Cedar cays	0 51	3½	2½
Tampa B.	11 6	1¾	1½
Boca Grande	1 9	1¼	¾
Tortugas	9 44	1½	1
Key West N.W.chan.	9 10	1½	1¼
" "	9 30	1½	1¼
United States, East coast.			
Lower Matacumbe B.	8 23	2¼	1¾
Indian cay	8 23	2¼	1¾
Sand cay	8 40	2	1
Cape Florida	8 36	1¾	1½
Indian River inlet	7 23	1½	
Cape Canaveral	7 0?	4-6	
Mosquito inlet	7 44	2¾	1¾
St. Augustine inlet	8 10	4¾	3¾
St. John R.	7 43	5½	5
Cumberland Sd.	7 48	6¾	6
St. Andrew Sd.	7 41	7¼	6¼
St. Simon Sd.	7 43	8¼	6¾
Doboy Lt. Ho.	7 33	7¾	7
Sapelo Sd.	7 33	7¾	6½
Ossabaw Sd.	8 19	8	6½
St. Catherine Sd.	8 37	8	6½
Fort Pulaski, Savannah entr.	7 18	7½	6½
Savannah, city	8 14	7¼	6
Port Royal Sd.	7 32	7½	6½
St. Helena Sd.	7 8	6½	5¼
North Edisto R.	7 10	6½	5¼
Charleston	7 24	5¼	4½
Bulls Island B.	7 16	5¼	4½
Winyah B., entr.	7 43	4	3
Georgetown	8 40	4¼	3¼
Cape Fear R., Smithville	7 19	6	4¾
Wilmington	9 6	3	2¼
Beaufort Hr.	7 21	3	2¼
Ocracocke inlet	7 4	2¼	2
Hatteras inlet	7 0	2	1¾
(Chesapeake bay and rivers.)			
Cape Henry	7 55	3	
" Charles	7 51	3¼	
Old Point Comfort	8 46	3	2¼
James R., City Pt.	2 11	3	2¾

* From the United States coast survey, the times of high water being the corrected and not the Vulgar establishment. The tides of ports in the gulf of Mexico westward of cape St. George are usually single day tides, the rise and fall increasing or decreasing with the moon's declination. The rise and fall being so small, the times and heights are both much influenced by the winds. Between cape St. George and cape Florida there are two tides during the twenty-four hours, subject to a large diurnal inequality.—*Tide Tables for the United States.*

Place.	High water, full and change.	Rise Springs.	Rise Neaps.	Place.	High water, full and change.	Rise Springs.	Rise Neaps.
	h. m.	ft.	ft.				
Richmond	4 28	3½	2¾				
York R., Moodys wharf	9 35	3½		**(New York.)**			
Piankatank R., Cherry Pt.	10 5	2	¾		h. m.	ft.	ft.
Tappahannock	0 42	2	1½	Sandy Hook	7 43	5	4¼
Rappahannock, Saunders wharf	3 2	2¾	2	New York, Governeur I.	8 16	4¾	4
Potomac R., Pt. Lookout	0 32	2	1¼	Tarrytown	9 57	4	3½
Blackistone I.	1 37	2-3		Hell Gate ferry	10 9	5½	4¾
Liverpool Pt.	5 57	2-3					
Washington Navy yard	7 43	2-3					
Patuxent R.	1 16	2	1½	**(Long Island sound to Portland.)**			
Annapolis	4 38	1	1				
Chester R., Rockhall Cr.	5 23	2¼	1	Montauk Pt.	8 20	2½	2
Patapsco R., Bodkin Pt.	5 42	1¼	1	Black I.	7 36	3½	2½
Baltimore	6 33	1½	1¼	Point Judith	7 32	3¾	3½
				Newport I.	7 45	4½	4
				Providence	8 15	5¾	5
(Delaware bay and river.)				New Bedford	7 59	4½	3¾
				Bird I. Lt. Ho.	7 59	5½	4½
Cape Henlopen	8 15	5½	4½	Cuttyhunk	7 44	3¾	3¼
Delaware breakwater	8 0	4½	3¾	Quicks hole, S. side	7 36	4¼	3
C. May	8 17	5½	4½	" N. side	7 31	4¼	3½
Egg I. Lt. Ho.	9 4	7	5¾	Kettle cove	7 48	5	4½
Mahon R.	9 10	7	6	Woods holl, entr. from Vineyard Sd.	7 42	1¾	1½
Newcastle	11 16	6¼	5½	Woods holl, entr. from Buzzard B.	7 59	4¾	4
Philadelphia	1 22	7	5¾	Tarpaulin cove	8 4	2¾	2
				Gay Hd.	7 39	3¼	2¾
				Menemsha bight	7 45	4	2½
(New Jersey.)				Holmes hole	11 43	1¾	1¼
				Edgartown	0 24	2	1¼
Cape May landing	8 19	6	5	Hyannis	0 31	3¼	2¾
Cold Spring inlet	7 32	5½	4½	Nantucket	0 27	3¼	2¾
Little Egg Hr.	7 50	4½	3½	George shoals	10 30	7	
				Monomoy	0 7	3¾	3¼
				Cape Cod	11 30	13	
(Long Island sound.)				Provincetown	11 22	10	9¼
				Wellfleet	11 5	13¼	12
Watch hill	9 0	3	2¾	Barnstable	11 22	10	8½
Stonington	9 9	3¼	2¾	Plymouth	11 4	10	8½
Little Gull I.	9 38	3	2¾	Boston Lt. Ho.	11 9	11	9½
New London	9 28	3	2½	Boston, Charlestown	11 27	11	9½
New haven	11 16	6½	5½	Salem	11 13	11	9¼
Bridgeport	11 11	8	6¼	Gloucester Hr.	11 2	10	9¼
Sheffield I.	10 58	8¼	7½	Rockport	10 57	9¼	8½
Lloyd Hr.	11 1	8¾	7¾	Annisquam	11 0	9¾	9
Oyster B.	11 7	9¼	8	Ipswich	11 26	9	8½
Sands Pt.	11 13	9	7¾	Newburyport	11 22	8¾	8
New Rochelle	11 22	8½	7½	Portsmouth	11 23	9¼	8¾
Throgs neck	11 20	9¼	7¾	Richmond I.	11 30	11	9¼
				Portland	11 17	9½	9
				Kennebec R. (Hanniwells Pt.)	11 15	9	7½
				Herring gut	10 58	10	8½
				Camden Hr.	11 8	10½	9¼
				Belfast	11 5	10½	8¾
				Carver Hr.	11 0	10	6

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Place.	High water, full and change.	Rise. Springs.	Neaps.	Place	High water, full and change.	Rise. Springs.	Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Mount Desert I., S.W. Hr.	11 2	10¾	9¼	Grindstone I.	11 47	41	34½
,, Winter Hr.	10 52	11¾	10½	Folly Pt., mouth of Petitcodiac R.	11 49	45	38
Narraguagus B.	10 23	12½		Cumberland basin, Sackville	11 55	45¼	38
Little R.	10 58	15¾		Monckton railway	0 15	47	37½
Bay of Fundy, Nova Scotia.				*Nova Scotia.*			
Cape Sable, Barrington B., Clam Pt.	8 27	8½	6½	Negro Hr.	8 12	7	5¾
,, Clarke Hr.	8 58	11	9	Shelburne	8 4	7	5½
Seal I., Cape Sable	9 49	12¾	10½	Rugged I.	7 59	7½	6
Pubnico	9 25	12	10	Port Mouton	7 54	7½	5¾
Argyle, Jones Anch.	9 27	12¾	10½	Liverpool B.	7 50	8	5
Ellenwoods Anch.	9 54	13	10½	Port Medway	7 50	8	5
Chebogue	10 4	15	11¾	Cape la Have, Spectacle I.	7 48	7	5¾
Yarmouth	10 9	16	13	La Have, Crooked chan.	7 51	7¼	6
East Sandy cove, St. Mary B.	10 33	21½	17½	,, Moshers I.	7 51	7	5¾
Petit passage	10 41	22	18	,, Getsons cove	7 55	7¼	6
Grand passage	10 43	20¾	17	,, Bridgewater	8 6	8	6
Sandy cove, St. Mary B.	10 47	23	19	Lunenburg B., Spindlers cove	7 54	7¼	6
Digby gut	11 0	27½	23	Mahone B., Heckman Anch.	7 45	7¼	6
Port George	11 17	32	28	,, Princes inlet	7 42	7¼	6
Isle Haute	11 21	33	28½	,, Ham I.	7 47	7¼	6
Black Rk.	11 20	36	31	,, Martin R.	7 43	7½	6½
Spensers Anch.	11 42	39	33	,, Chester	7 44	7	5¾
Parrsboro, basin of Mines	0 17	43	37½	Little Tancock I.	7 43	7¼	6
Horton bluff, basin of Mines	0 30	48	40	St. Margaret's B., Shut-in I.	7 47	7¼	6
Noel B., basin of Mines	0 41	50½	43½	Blind B.	7 46	7½	6
				Prospect R.	7 43	7	6
				Halifax Hr.	7 49	6	5
				Jeddore Hr.	7 45	6¼	4¾
				Ship Hr.	7 54	6¼	4¼
				Sheet Hr.	8 6	6¼	4½
				Beaver Hr.	7 40	6¼	4½
				Liscomb Hr.	8 0	6¼	4¼
Bay of Fundy, New Brunswick.				Island Hr., Country Hr.	7 40	6¼	5½
				Whitehaven	8 0	6½	4½
Machias, Seal I.	11 5	18	14¾	Sable I., N. side	7 30	4	
Seal cove, Grand Manan	10 54	20	15	,, S. side	6 30	4	
*Grand Hr., Grand Manan	11 7	21	17½	Canso Hr.	7 48	6¼	4¾
Fish Hd., Grand Manan	11 16	22½	18¼	Crow Hr.	8 0	6¼	4½
West Quoddy	11 12	21	17	Guysborough	8 20	6¼	4½
Campobello (Welchpool)	11 21	23½	20	Pomquet	9 15	4	2¼
St. Andrew	11 32	25	21½	Antigonish Hr.	9 0	4	2
L'Etang Hr.*	11 19	23½	20	Cape George	9 15	4	2
Lepreau	11 18	24½	21	Merigomish	10 6	5¼	3½
St. John Hr.	11 21	27	23	†Pictou Hr.	10 0	6	4
Quaco	11 35	30	25	Caribou Hr.	10 0	6	4
Spicers cove (near C. Chignecto)	11 35	37	30½	Amet Sd.	10 0	8	5
				Tatamagouche	10 0	8	5
				Wallace Hr.	10 30	8	5

* In September 1870, a rise of 30 feet was observed both at Grand Manan island and L'Etang harbour.
† The tides are subject to a large diurnal inequality.

Place.	High water, full and change.	Rise. Springs.	Neaps.
	h. m.	ft.	ft.
Pugwash Hr.	10 30	7	4
Bay Verte	10 0	9	5

Prince Edward island.

Place.	High water, full and change.	Rise. Springs.	Neaps.
East Pt.	8 30	3½	2
Boughton Hr.	8 40	5	2¾
Cardigan B.	8 40	5	3¼
Cape Bear	9 0	6	3
Hillsborough R., Charlottetown*	10 45	9½	8
Hd. of river	11 0	10	7
Crapaud	10 0	8	6
Bedeque Hr.	10 15	7	5
Egmont B.	3 0	4	2
Minimegash	3 30	5	3
Cascumpeque Hr.	5 40	3	2
Richmond B.	6 0	3	2
Cape Turner	6 10	4	2
Grand Rustico	6 40	4	2
Tracadie	7 0	3½	2
St. Peter Hr.	8 30	4	2½

Cape Breton island.

Place.	High water, full and change.	Rise. Springs.	Neaps.
Gut of Canso, N. entrance	9 15	4	2
" P. Hastings	9 10	4½	3
Port Hood	9 0	4½	2
Mabou R.	9 0	4	2
Chetican	8 15	3½	2
Cape North	8 0	4	3
St. Anne B.	8 34	6	4½
Sydney Hr.	8 15	5	4
Menadou B.	8 15	5½	
Louisburg Hr.	8 0	5	4
St. Peter B.	7 30	6	4
Poulament B.	7 50	6	4
Habitants Hr.	8 20	6½	4¾
Bear Hd.	8 30	4½	3
Arichat	8 10	5	4

Labrador and North shore of gulf of St. Lawrence.

Place.	High water, full and change.	Rise. Springs.	Neaps.
Eclipse Hr.		5	
Nachvak B.	7 8	5	3¾
Nain	7 9	6½	
Ford Hr., Paul I.	6 46	6½	4
Hopedale	5 38	7	4
Aillik B.		7	
Webeck	6 21	7	4
Holton Hr.	6 44	5¾	4
Ice Tickle	6 20	7	4
Run-by-guess	7 5	5¾	
Pomeroy inlet, Indian Hr.	6 20	7	4

Place.	High water, full and change.	Rise. Springs.	Neaps.
	h. m.	ft.	ft.
Rigoulette	7 37	4	3½
Pottle cove	6 57	6	
Charles I.	7 30	6-7	
Independent Hr.	6 51	5¾	4½
Curlew Hr.	6 40	5¾	4¼
Indian Tickle	6 37	6	4
Domino Run Grog I.	7 23	5¼	3½
Domino Hr.	7 4	5¼	3¼
Punchbowl	6 59	5½	4½
Frenchman Run	7 13	5½	3
Seal Is.	6 39	5½	4
Comfort bight	7 3	5½	2¾
Venison Tickle	6 47	5½	4
Dead Is.	6 51	5½	3¼
Square I. Tickle	7 14	4½	3½
Occasional Hr.	6 48	5	3½
Fishing Ship Hr.	6 51	5½	4
Francis Hr. bight	6 40	5	3½
Little Hr.	7 4	4½	
Spear Hr.	7 22	4½	3
Potty Hr.	7 12	4½	3½
St. Lewis Sd.	6 40	3½	1
Assizes Hr.	7 5	4¾	3¾
Fall Hr., Telegraph Pt.	6 40	3½	
Chateau B.	7 16	4	2½
Red B.	8 19	4½	2
Pinware B.	9 10?	4	2¾
Forteau B.	10 25	5½	3·
Bradore B.	10 35	4¾	2¾
Belles Amour Hr.	9 0	4½	2½
Mistanoque Hr.	10 30	6	3
Antrobus I.	10 30	5	3
Wapitagun Hr.	10 30	5	3
Coacoacho B.	10 30	5	3
Kegashka B.	10 45	5	3
Little Natashquan Hr.	11 0	5	3
Appeetetat B.	11 10	5?	3?
Betchewun Hr.	11 32	5	3
Clearwater Pt.	11 30	5	3
Mingan Hr.	1 16	6	4
" I.	1 30	6	4
Anticosti I., Heath Pt.	11 20	4½	2½
" Bear B.	1 10	5	3
" West Pt.	2 0	6	4
" South-west Pt.	1 55	6	4
Cawee Is.	1 50	9	5
Egg I.	2 0	11	6
Bay of Seven Is.	1 40	9	5

River St. Lawrence.

Place.	High water, full and change.	Rise. Springs.	Neaps.
Point de Monts	noon.	12	6
Cape Chatte	noon.	13	8
Goodbout R.	1 52	11	6
St. Nicholas Hr.	1 55	12	7
Manicouagan R.	2 15	12	7
Matane R.	2 15	11	7
Little Metis	2 10	13	8
Bersimis R.	2 0	12	7

* There is considerable diurnal inequality in height of the tides, which, however, principally affects low water level; consecutive high waters varying from 3 to 15 inches; the low waters 3 inches to 3½ feet.

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Place.	High water, full and change.	Rise Springs.	Rise Neaps.	Place.	High water, full and change.	Rise Springs.	Rise Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Bic I.	2 15	14	8½	Flat Island cove	8 27	6½	5
Port Neuf	2 10	14	8½	Oderin	8 6		5
Saguenay R., Ta-dousac	2 45	17	10	Burnt Is.	7 48	7	
,, Chicoutimi	4 11	12	8	St. Kyrans	8 20	7	5
Green I.	2 45	16	9½	Great Sandy Hr.	8 9	6¼	5
Brandy Pots	3 0	17	10	Woody Is.	8 9	7	4½
Rivière du Loup	3 10	16¼	10½	Jean-de-Gaunt I.	8 6	7	5
Orignaux Pt.	3 47	17½	13	Buffett Hr.	8 12	7	5
Coudres I., Prairie B.	4 25	18	13	Little Pinchgut	7 51	7	5
L'Islet	5 11	18	12¾	Famishgut	8 4	7	4½
Grosse I.*	5 21	19	13	Little Placentia	7 58	7	4½
Berthier pier	5 40	17½	14	Placentia Hr.	8 30	7	5
Orleans I., North traverse	5 40	17	13	Cape St. Mary	8 30	7	5
Orleans I., St. Laurent	6 20	17½	14½	North Hr.	8 0	7½	5
				St. Mary Hr.	7 40	7½	5
Quebec	6 49	17½	12	Trepassey Hr.	7 0	6½	5
Carouge R.	7 15	16	11	Cape Race	7 0	6½	5
Frechette I.	8 0	14	9	Ferryland Hr.	7 20	5¼	3½
Port Neuf	8 30	14	9	St. John's Hr.	7 30	3¾	3¼
Grondine	9 0	9	6	Spaniards B.	7 45	4¼	3
Cape Roche	9 30	6	4	Harbour Grace	7 25	4¼	3
Batiscan	9 48	3½	2	Carbonear	7 20	4¼	3
Champlain	9 45	3	2	Hants Hr.	7 13	4	2¼
Three Rivers	11 30	1		Hearts Content	7 33	4	2¼
				Bull I.	7 22	3½	2

South shore of Gulf of St. Lawrence.

Place.	High water, full and change.	Rise Springs.	Rise Neaps.	Place.	High water, full and change.	Rise Springs.	Rise Neaps.
				Deer Hr.	7 49	3½	2
St. Paul I.	8 40	5	3	Random Hd. Hr.	7 8	3½	2¼
Magdalen Is.	8 20	3	2	Smith Sd.	7 8	3½	2¼
Mount Louis B.	2 0	6–8	4	Trinity Hr.	7 10	4	2
Magdalen R.	1 15	6–8	3–4	Catalina Hr.	7 0	6	4
Gaspé basin	2 40	5	3	Bonavista	7 25	3½	2¼
Carleton Pt.	3 0	6	4	Kings cove	7 15	3½	2¼
Dalhousie Hr.	3 10	9		Goose B.	7 22	4½	2½
Campbelltown, Ristigouche R.	4 0	10	7	Barrow Hr.	6 13	4½	2½
Bathurst	3 15	7	4	Freshwater B.	7 30	4	3
Shippigan	3 42	5½	3	Pools Hr.	7 0	4	3
Caraquette Hr.	2 40	6	3	Funk I.	7 0?	2–3?	
Miscou	2 30	5	3	Gander Hr.	7 55	4	3
Miramichi B., Portage I.	4 45	5	1½	Fogo I., Fogo Hr.	7 15	4½	3
Sheldrake I.	6 0	5	3	Seldom-come-by	7 13	4½	3
Beaubère I.	6 30	6	4	Change I.	7 20	4½	3
Escuminac Pt.	4 10	4	2½	Toulinguet Hr.	7 8	4	3½
Richibucto R.	3 30	4	2½	Exploits Burnt Is. Hr.	7 17	4½	2½
Buctouche R.	7 0?	4?	2?	Fortune Hr.	7 14	4	3
Cocagne R.	7 30?	4?	2?	Leading Tickles	7 7	4½	3
Shediac Hr.	noon.	4?	3?	Troy Town Hr.	7 5	4½	3
Jourimain I.	9 30	6	3	Cutwell Hr.	7 6	4½	3
				Halls B.	7 16	5½	3½
				Little B.	7 22	4½	3
				Green B., N.W. arm	7 9	4	3
				Snooks arm	7 12	4	3½
				Paquet Hr.	6 49		

Newfoundland.

Place.	High water, full and change.	Rise Springs.	Rise Neaps.	Place.	High water, full and change.	Rise Springs.	Rise Neaps.
				Fleur de Lis Hr.	7 15	2–4	
				Hauling arm, White B.	7 15	6	4
Miquelon Rd.	8 33	3¼		Riverhead, White B.	7 0	4½	2¼
St. Pierre	8 33	6½	4½	Canada B.	6 46	5¼	1½
Lamalin Hr.	8 25	7½	5½	C. Rouge Hr.	7 0?	6	4
Great Laun	8 15	7	4	Croc Hr.	7 4	4½	
Great St. Lawrence Hr.	8 30	7	4	Four Hr.	7 5	4	
Burin Hr.	8 45	6½	4½	How Hr.	7 18	4	1½
				Crémaillère Hr.	7 13	4½	2¾

* From Grosse I. to Quebec, both flood and obb streams commence about one hour after low and high water by the shore. The duration of the flood stream is about 5¼ hours, that of the ebb stream 7¼ hours.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
St. Lunaire B.	7 6	5	2¾
Kirpon Hr.	7 5	5	1¾
Pistolet B.	7 39	3¼	2½
St. Barbe B.	10 0	4	3
Ste. Geneviève B.	10 43	6¼	4
Old Férolle Hr.	9 46	5?	
St. Margaret B.	10 31	5¼-6½	
Castors Hr.	10 50	5?	
Good B.	10 40	7½	5½
Port-au-Choix	10 40	7½	
Hawke B.	11 0	6	4
Cow Head Hr.	10 30	6¼	4½
Bonne B., Norris cove*	10 40	6	4½
Frenchman cove, B. of Islands	10 0	6	5
Fox I.	9 15	5½	3¾
Head Hr.	10 20	6¼	4¼
Isthmus, B.	9 40	5¼	3¼
St. George Hr.	9 45	5¼	3½
C. Anguille	9 0	4½	3
Cape Ray	9 15	6	4
Port Basque	8 55	5¼	3½
Garia Hr.	8 50	5½	3¾
La Poile B.	9 0	6	4
Grand Bruit Hr.	8 43	5¾	4
Connoire B.	8 40	5¾	4
Burgeo Is.	8 32	6¼	4
Little R.	8 40	6¼	4
La Hune B.	8 40	6¼	4½
Fransway B.	8 40	6¼	4¼
Rencontre B.	8 55	6¼	4¼
Hare B.	8 38	7	
Great Jervis Hr.	8 55	6½	5
Despair B., Shipcove	8 36	7¼	5½
Hermitage cove	8 45	7	4¾
Harbour Breton	8 52	7	5¾
Belloram Hr.	8 59	6	
Long Hr.	8 50	7	5½
Grand le Pierre Hr.	9 10	7	5
Frenchman cove	8 47	7	5¼
Grand Bk.	8 48	6¼	5¼
Brunet Is.	9 3	6¼	4¼
Hudson strait.			
P. Burwell	9 25	19	14¼
Köksoak R. entr., Ungava B.	8 52	38½	
Stupart B.	8 11	24	18
Aske inlet	8 32	30	22
Nottingham I.	9 30	13	9½
P. de Boucherville	9 30	13	9½
Digges I.	8 53	8½	6¼
Hudson bay.			
York factory	11 15	10–14	
P. Churchill	7 6	15½	11¾
Marble I.	4 10	12	9
Fury and Hecla Str., Melville Pen.	7 0	8	

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
Davis strait.			
	h. m.	ft.	ft.
Frobisher B., N.W. arm		45?	
Kingua fiord, Cumberland Sd.	6 0	20	
Arctic regions, Greenland, West coast.			
Nennortalik	6 0	8¼	
Julianshaab	5 6	7	5
Arsuk	6 25	12	9
Frederickshaab	6 22	9	5
Godthaab	7 0	12	
Holsteinborg	6 30	10	
Whalefish Is.	8 15	7½	
Godthavn	9 0	7¼	
Upernivik	11 0	8	
North Star B.	11 8	7½	
Wolstenholm Sd.	11 3	7½	
Smith sound and northward.			
Port Foulke	11 14	10	7½
Rensselaer Hr.	11 52	10¾	7¾
Thank God Hr.	0 13	5½	3¾
Discovery Hr.	11 35	6½	4¼
C. Sheridan	10 37	2½	
Barrow strait.			
Port Leopold	0 10	5	
Beechey I.	0 30	6	
Griffiths I.	0 15	3¾	2¾
Melville island.			
Dealy I., Bridport inlet	1 48	4	
Winter Hr.	1 30		
Baring island.			
Bay of Mercy		2	
Prince of Wales Str.		3	
Africa, South and East coasts.			
Table B.	2 40	5	3½
Simons B.	2 44	5½	3½
Dyer I.	2 50	5	
Cape Agulhas	2 50	5	

* Diurnal inequality sometimes 2 feet at high water and 1½ feet at low water, when moon has extreme declination.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
St. Sebastian B., Port Beaufort	3 8	6		P. Cockburn, Pemba I.	4 0	12	8
Mossel B.	3 30	6		Tanga B.	4 0	12	7
Knysna Hr.	3 30	6–7		P. Mombasa	4 0	12	8
Plettenberg B.	3 10	6		Kilifi	4 0	12	8
Cape St. Francis	3 34	5		Malindi	4 5	12¼	9¼
Algoa B., P. Elizabeth	3 10	6		Ozi Anch.	4 8	10¾	6½
Bird Is.	4 0	4–5		Lamu Hr.	4 40	11	7
Kowie R., P. Alfred	3 50	4–5	3	Manda B.	4 0	10	7
Waterloo B.	4 0	6		Patta B.	4 30	10	8½
East London, Buffalo R.	3 47	5	3¾	Port Durnford	4 25	12	9
St. John R.	4 8	5¼		Kisimayu B.	4 0	10	6
Port Natal	4 30	6		Juba R.	4 30	9–10	
Delagoa B., P. Melville	4 30	15		Brawa	4 10	8	
" Shefeen I.	4 40	12		Marka or Muerka	4 30	8	
" English R., Portugueso Factory	5 20	12		Mogdishu	4 30	8	
				Warsheik Rd.	4 30	8	
				Athelet	3 0?	6?	
				Ras Hafun	6 15	4	
				Ras Asir (Guardafui)	6 15	6	4½
Africa, East coast.				*Gulf of Aden, and Sokotra island.*			
Limpopo R.	4 20	11		Sokotra	7 20?	8	
Innamban R.	5 38	11	7	Abd al Kuri	8 30	6	
Bazaruto B.	4 26	12		Kal Farun	8 20	6	
Chiluan I.	4 49	18½	13	Bandar Aluleh	6 45	6	
Sofala R.	4 0	19		Berbereh	9 30	8½	6
Pungue R. entr.*	4 22	17		Zeila	7 45	8–9¼	5¾–8½
Zambezi R. entr.	4 30	12–15		†Obokh	8 15?	8½?	
Kilimán R. entr.	4 20	12¼	7½				
Macuso R.	4 20	14	12	*Madagascar, East coast.*			
Angoche R.	4 0	10–12					
Antonio R.	3 15	13	10	P. Nievre, Diego Suarez B.	3 33	6½	4½
Mozambique Hr.	4 15	12		Port Ambavarane	4 15	5¾	
Almeida B.	4 10?	12–15		" Leven	3 30	7½	
Pomba B.	4 15	15	11	Andrava B.	3 30	7	
Ibo Hr.	4 15	11		Antongil B., P. Choiseul	4 0	5	
Kero Nyuni pass	4 15	13	8	Tangtang Hr.	4 30	6	
Ras Msangi	4 10	14	9	Madame I., St. Mary Hr.	4 0	5	
Tunghi B.	4 5	14	9	Fenerive		3½	
Keonga B.	4 10	12		Tamatave	4 18	8	
Rovuma B.	4 10	12		Vatomandri	4 20	7¾	
Msimbati Chan.	4 0	11		Fort Dauphin	4 30	4–5	
Mto Mtwara	3 45	12					
Mikindani	3 45	12		*Madagascar, West coast, &c.*			
Mgau Mwania Mungulho	3 45	12					
Lindi R. entr.	4 5	11		Cape St. Mary	4 30	10–12	
Mchinga B.	4 0	12		St. Augustine B.	5 50	10¼	7¼
Kiswere Hr.	4 25	12		Ranobe P.	6 0	9	
Kilwa Kisiwani	3 45	12	7½	Nosi Hao.	5 0	8½	5½
Chole B., Mafia I.	4 0	15	10	Morombé C.	6 0	12½	8½
Dar-es-Salaam	4 20	14	9	Ampasilava B.	5 0	14½	9¾
Latham I.	4 0	12		Morondava	4 36	14½	10½
Zanzibar Chan.	4 20	15	10	Barren Is.	4 45	12	
Zanzibar	4 15	15	10	Maintirano (Kivinja)	4 45	16½	11½
Kokotoni Hr.	4 10	15		Boyanna B.	4 33	10¾	7¼
Pangani R.	4 15	15	10				
Pemba I., Mchengangazi	3 43	11	7¾				

* Time of high water is irregular at neaps.
† Considerable diurnal inequality, chiefly affecting low water of neap tides.

Place.	High water, full and change.	Rise.		Place.	High water, full and change.	Rise.	
		Springs.	Neaps.			Springs.	Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Makambi	4 27	11	7¾	Shukra	8 0	6	
Bombetoke B., Mojanga	4 45	12½	8¾	Makatein	9 0	6	
Mahajamba B.	4 30	11¾	8	Ras-al-Aseida	8 30	5½	
Moramba B.	3 53	11¾	8¼	Makalla	8 30	7	
Nosi Lava	4 20	11¾	8¼	Ras Sharma	9 0	8	
Maravaay	7 0	11¾	8¼	Merbat	9 0	7	
Port Radama	4 40	13		Khorya Morya B. and Is.	8 20	6½	
Nosi Bé	4 29	14	8¾	Ras Madraka	9 0	10	
Minow Is.	5 0	15	10	Shab Kadun	9 20	10	
Ampamonti B.	4 23	10½		Jezirat Hamar-al-nafur	9 30	10	
Courrier B.	4 21	10		Shab Bu Saifa	9 45	10	
P. Liverpool	4 27	8		Ghubbet Hashish	10 0	10	
Glorioso Is.	5 0	10?		'Om-Rasas, Masira	10 0	10	
				Ras Sheiballa	10 0	10	
Red sea.				Ras-al-Hadd	9 30	9	
				Khor-al-Hajar	9 30	10?	
Bab-el-Mandeb, Perim I.	8 0	6½-7¾	5½-6¼	Khor Jarama	9 30	10	
Mokha Rd.	noon.	4½					
Hanish Is.	1 0	2½	1	*Gulf of Oman and Persian gulf.*			
Hanfela B.		3-4					
Dahalak Bk.	1 10?	3-4		Bander Khairan	9 0	5	
Annesley B.	1 0	3-5		,, Jissa	9 0	5	
Massawa	1 0	4	3	Maskat	9 15	6-9	
Kamaran B.	10 0	3¾		Jezirat Jun	9 30	10?	
Loheiya	1 30	3		Suadi Is.	9 30	10?	
*Sawákin	1 0?	1½?		Kubbat Ghazira	9 30	10	
Trinkitat	noon. (Feb.)	1?		Khor-ash-Shem	10 40	8½	
Makawar I.	0 30	2		Ras-al-Khaimah	11 45	7	
Lith		2		Al-Bidaa	8 30?	6?	
Jidda		2?		Bahrain	6 10	5¾	4¾
Mersa Shab	6 0			Jezirat Arabi	6 30?		
Hassani I.	6 0			,, Kubbar		8½	
Mardunah I.	6 0	3		Kuweit	0 15	9	
Brothers Is.	6 0	2		‡Al Basra, bar, Euphrates R.	11 30	10	8
Koseir	6 0	3		,, town	6 0?	9?	
Omeider I., G. of Akabah	6 0	4		Jezirat Kharg or Kharag	8 0	6-7	
Akabah		4		Abushahr	7 30	6-8	4-6
Jifatin	6 0	2		Umm an Nakhailah	7 30?	8?	
Ashrafi Is.	6 0	1¾		Jezirat Kais	0 30	7½	
Ras Iknaisi	5 30	1¼		,, Tanb		8	
Tor	6 0	1¼		Linja	noon?		
Ras Gharib	11 30	1½		Basidu	noon.	10	
Sheratib Rf.	11 0	3		Kishm	11 0	12	
Zafarana Lt. Ho.	11 0	5½		Jezirat Hormuz	10 45	13	
Suez B., Hd. of gulf	11 0	7	4				
				Coast of Beluchistan.			
Arabia, South-east coast.				Jáshak (Jashk) B.	9 30	9	
				Khor Rabiji	10 10	9½	3
Bandar Fukom	10 0	8½		Chahbar B.	9 30	9	
Aden	7 54	7	4½				

* One high and one low water in the 24 hours. Winter mean level 1½ feet above summer level.
† The tides at Aden, Karachi, Bombay, and other ports in India, are subject to a large diurnal inequality, which may either accelerate or retard the times of high water, sometimes to the amount of an hour and a half or two hours, and increase or diminish the rise by one foot or more.—*See Tide Tables for the Indian ports, published by the authority of the Secretary of State for India.*
‡ In summer the day tides are the highest, and in winter the night tides.

Place.	High water, full and change.	Rise.		Place.	High water, full and change.	Rise.	
		Springs.	Neaps.			Springs.	Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Gwatar B.	9 30	8-9		Nosari Khari bar	3 0	18	
Gwadar B.	9 30	8-9		Gundevi R.	2 0	19	15½
Sunmiyani Hr.	9 0	9?		Bulsar Khari	1 45	18	14½
				Omersari R.	1 45	18	14½
Hindustan, West coast.				Daman bar	1 30	17	
				Bassein creek	11 49	11½-15½	8½-11
Karachi, Manora Pt.	10 19	9½	5-6	Vesava	11 42	14	8½
Indus R., Gisri entr.	9 45	7-10		Bombay, (Apollo Bandar)*	11 35	14¼	11¼
Piti R. entr.	10 5	9		Chaul	11 0	11¼	8
Kúdi or Ooondee R.	9 50	10		Rajpuri R. entr.	10 47	14	8-10
Dubba R. ,,	10 10	8		Bankot or Savitri R.	10 37	9½	7¼
Hajamro R. ,,	10 19	9-10		Dabhol R.	10 40	8	5½
Keti	noon?			Boria B.	10 0	10	8
Sier R., entrance	10 30	11		Jaigarh	10 16	8¾	7¼
,, Juggi	1 30	6		Ratnagiri	10 40	6¼	4½
Kediwara mouth	10 19 ?	9-10	5-8	Rajapur R. entr.	10 45	6½	4½
Khori creek bar	10 19	8½-12	6-7	,, town	0 20	7	
Lakhpat	0 15	12		Vizindrug or Geriah	10 16	6¾	4¾
Goria Cr.	11 19	8½-12	6-7	Deogarh Hr. entr. †	10 13	8¼	6¾
Mandvi Rd.	11 33	15	11	Angria Bk.	10 30	9	
Tuna	1 50	16	13	Malwan	10 1	7½	6
Hanstul mouth	1 40			Vengurla	11 13	6¾	5½
Juria	1 40	16	13	Aguada (Goa) B.	10 39	6¾	5½
Nawanagar	1 45	18	14	Murmagoa	10 33		
Rojhi	1 40	18	14	Karwar B. ‡	10 36	6¾	4½
Serain	1 0	16	13	Tadri R. bar	10 0	6½	5
Ajád	0 50	14	11	Mangalore	11 0	7	5
Beit	0 12	11½	9½	Kannanur	10 51	4½	3½
Mouth of Kutch G.	11 30			Tellicherri	11 3	4½	3½
				Kadalur	10 47	5	4
Rupenbandar	10 30	10	7	Calicut	10 59	5	4
Porbandar	9 36	8½	6½	Beypur	11 16	5	4
Navibandar	10 17	8	6½	Cochin R. entr.	11 26	3	1½
Mangról Bandar	10 30	7	5	Aleppi	2 0	3	1-2
Verawal Rd.	10 27	9	7½	Quilon	0 38	2?	2½
Mandvi B.		8	6				
Diu Hr.	11 0	6	4½				
Navinar	0 47			*Ceylon.*			
Jafarabad Hr.	1 48	10½	7	Colombo	1 50	2	
Salbet (P. Albert Victor)	1 48	10¾	7½	Dodandewi B.	1 50	1½	
Mahuwa	2 22	13¼	9½	Point de Galle	2 3	2	
Goapnath Pt.	2 25	16	9-10	Belligam or Red B.	2 20	2¼	
Piram I.	3 32	27¼	22¼	Kirindi	3 30	2	
Cogha	3 58			Batticalao Rd.	5 0	2-3	
Bhaunagar	4 32	32	24?	Trincomali Hr.	9 23	2	1½
Singotir Mata	5 20	24		Kankasanturai	7 35	3	2
Cambay, town	5 10	Night 30/Day 23					
Dhadar R. entr.	4 30	27	20-22	*Bay of Bengal, West shore.*			
Broach Pt., Narbada (Nerbudda) R.	3 40	25		Tuticorin, G. of	1 28	3¼	1?
Surat Rd.	2 45	19	15	Painban pass §	1 48	3	
,, town	4 0	19					

* From September to March the night tides are higher than the day tides ; in December and January, at springs, the difference is 2 to 3 feet. From March to September the day tides are higher than the night tides ; the difference being greatest in June and July at springs.

† From observations made in November and December.

‡ Spring tides rise, a.m. 6 feet, p.m. 7½ feet, from October to March ; and the contrary during the rest of the year.

§ Tides irregular and much affected by winds.

Place.	High water, full and change	Rise.		Place.	High water, full and change	Rise.	
		Springs.	Neaps.			Springs.	Neaps.
	h. m.	ft.	ft.				
Kottaipatam, Palk Str.	11 0	1¼		*Islands in Indian ocean.*			
Negapatam	9 0	2½					
Karikál	9 0	4¼	2		h. m.	ft.	ft.
Madras Rd.	9 1	3½	2¼	Kerguelen, Christmas Hr.	2 0	2	
Pulicat shoals	9 25	2¾		,, Observatory B.	6 0	5¾	2½
Nizampatam	9 0	4½	3½	,, Betsy cove	0 35	3	
Masulipatam	9 15	5¼ ?	3¼ ?	St. Paul. I.	11 0	3	
Coringa or Coca-nada B.	8 50	5¼	3¼	Amsterdam I.	11 0	3	
Vizagapatam	8 26	5½	3½	Keeling Is., P. Refuge	5 30	5	
Kalingapatam	8 33	4¾	3	Christmas I.	7 20	4–5	
Gopalpur	9 40	6¼	4½	Rodriguez I.	0 30	5	3¼
Chilka lake	9 10	4¼	3	Mauritius, P. Louis	0 30	3	2
Devi R. entr.	8 54	9	6½	,, Grand P.	0 30	2½	1¾
False Pt. Anch.	9 18	7	4	Reunion or Bourbon I., St. Pierro	noon.	3½	
Dhamra R. entr.	9 45	9¼	6	,, St. Denis	0 22	2½	
Balasor R. entr.	10 0 ?	11–13	8	,, St. Paul	1 7	4	
Saugor I.	10 4	15¾	12¼	Cargados Carajos shoals	2 0	4	
EasternChan. L.-V., R. Hugli entr.	8 43	10¾		Farquhar Is.	4 0?	7	5 ?
Diamond Hr.	11 55	16½	12¼	Providence I.	6 0	8	
Calcutta * (Kidderpur)	2 2	17	12	Cosmoledo group	4 0?	8 ?	5 ?
Mutlah R., Western or Ward Chan.	9 0	10		Aldabra I.	4 0?	8	5
,, Bidda R. entr.	10 0	14		*(Comoro islands.)*			
,, Muda Kali, Canning town	11 45	15		Mtamuhuli		11	
Bay of Bengal, East shore.				Shindini		11	
Hastings Hr., Mergui Arch.	10 40	14		Maroni B., Comoro	4 53	10	
Gregory group	10 20	14	10	Doáni, Mohilla	4 0	11–12	
Christmas I.	10 44	16	9½	Fumboni R., Mohilla	4 30	13	
Mergui	10 29	18	11	Numa-Choa, Mohilla	3 0	14	
Tavoy R. entr.	10 26	15½	10½	Johanna Anch.	4 30	14	
,, town	noon.	12 ?		,, Pomoni	4 30	14	9
Yé R., Stag I.	0 13	18	12½	Zaudzi Anch., Mayotta	4 10	12	
,, Yé	1 8	13¼	6½	*(Seychelle archipelago.)*			
Amherst	2 21	20–22	12				
Moulmein	3 41	14–15	11–12	Mahé I.†	4 32	3½–5	3 ?
Martaban	2 20	21		Curieuse I.	5 10	7	
China Bakir Lt. Ho.	3 3	16	11	Amiranté Is.	5 0	8 ?	
Rangoon R. Elephant Pt.	3 32	19	13	*(Chagos archipelago.)*			
,, town	4 36	19	14				
Alguada lighthouse	9 13			Diego Garcia	1 38	5¾	3¾
Bassein R. Sagu I.	9 47	7½	5¾	Peros Banhos	1 30	5	
Khwa (Gwa)	10 30	6		Salomon Is.	1 30	5	
Ramree Rd., Sagu I.	9 23	11	8	*(Maldives and Laccadives.)*			
Singaung I.	9 14	6½	3½				
Chedúba I.	9 15	10	7	Addu atoll	1 0	4	
Kyauk Pyu Hr.	10 0	9	6	Suadiva atoll	1 0	4	
Akyab, Arakan R.	9 37	7¾	5¼	Haddummati atoll	3 0	4	
Naaf R. entr.	10 0			Malè	0 30	3	
Kutabdia I.	11 56	13	8	Malcolm atoll	10 30	3	
Chittagong	1 12	13–15	7–10				

* In the river Húgli the night tides are highest from November to February ; the day tides highest from March to October.

† The height of the tide is affected by diurnal inequality, which is however, mainly confined to high water, the maximum difference observed between two successive tides being 2¼ feet, when the moon's declination was largest in amount. The sequence of the two tides is from the higher high water to the ower low water throughout the lunation.

Place.	High water, full and change.	Rise. Springs.	Neaps.	Place.	High water, full and change.	Rise. Springs.	Neaps.
	h. m.	ft.	ft.				
Ihavandiffulu atoll .	9 30	5			*Sumatra, East coast, &c.*		
Minikoi * . .	11 15 ?	5	3½				
Kiltan I. . .	10 30	7	4		h. m.	ft.	ft
Chetlat I. . .	10 30	7	4	St. Barbe . . .	6 0	6	
Laccadives, Cher-baniani Rf.	10 0	7	4	Badas I., Linga I.† .	6 0	12	
				Clifton Sh. . .	10 0	4–5	
(Andaman and Nicobar islands.)							
Labyrinth Is. . .	9 24	6¼	3½		*Sumatra, South and west coasts.*		
Cinque Is. . .	9 47	7	4¾				
Port Blair . .	9 36	6	5	Kalang Bayang Hr. .		2	
Strait I. . .	9 31	7½	5½	Benkulen . . .	6 0	3–5	
Port Cornwallis .	9 50	8	5½	Padang Rd. . .	6 50	3½	
Table I. . .	8 45	7½		Tapanuli B. . .	6 0	6	
Andaman Str. . .	10 24	9¾		Acheh Hd. . .	10 0	5	3½
Kar Nicobar, Sawi B.	10 0	5		Sabang B., pulo Weh	9 45	7	4¾
Nankauri Hr. .	9 15	8½					
					Durian strait.		
Malacca strait, Malay coast.							
Junkseylon I., E. side	10 10	9	7	Sabong I. . .		10	
Butang group . .	10 34	9		Deep Pt. . .	5 0	10	
Pulo Tubah . .	noon.	12		Red I. . .	5 0	10½	
Kedah . .	noon.	9					
Penang, Georgetown	noon.	9	7		*Banka strait.*		
Weld, port .	2 28	8	6				
Dinding Chan. .	3 15	9	5	Tobo Ali Pt.‡ .	8 30	10–12	
Pérak R. entr. .	3 15	9	5		10 0		
North sands .	5 30	15	12	Labu Pt. §	11 0	10	
Selangor . .	5 0	15	12	Lucipara pass'l .	irr.	10	7½
Kwala Klang .	5 0	14 ?		Nangka I. . .	7 0	9¾	
Kwala Salat Lumut .	6 0	10–12		Kalian Pt. . .	8 0	12	
L.V., One-fathom Bk.	6 15	14	10	Bersiap Pt. . .	6 30	12	
Aroa Is. . .		14	9	Cape Ular . .	6 30	12	
Cape Rachado .	5 30	13					
Malacca Rd. .	7 30	11	8½		*Gaspar and Carimata straits.*		
Off mount Formosa .	8 30	11	8½				
Tanjong Bulus .	9 30	10½	6–7	Gaspar Str. . .	2 30	4	
Singapore, New Hr. *	10 35	8	5	Montaran Is. . .	9 40	6 ?	
Rhio Str. . .	9 50	7	5				
					Java sea, Java, &c.		
Malacca strait, Sumatra coast.							
Diamond Pt. . .	noon.	9		Sunda Str., Mew B. .	6 0	3	
Langksa B. .	11 30	7		Krakatoa I. .	7 0	4	
Aru B. . .	noon.	8		Bantam . .		5	
Deli R. . .	2 0	7		Thousand Is.§ .	10 0	3½	
Pulo Berhala .	2 45	7		Krimon Is.§ .	8 0	6	5
Batu Bara R. .	3 0	7–10		Bawean I.¶ .	8 to 10	5¾	
Sungi Asahan .	3 30	10–12		Batavia § . .	10 0	2 ?	
Sungi Rokan entr. .	5 0	17		Surabaya Str.,¶** Zee Bk.	10 30?	4–6	
Rupat Str. W. entr. .	5 45	12					
Tanjong Lebang	6 30	8–9		,, Jansen Chan.	10 30?	8¼	
Siak R. entr. .	8 45	9	5				
,, off the town .		10					
Great Karimon .	11 0	12					

* Throughout the Eastern archipelago, the tides are largely affected by diurnal inequality. At Singapore, the general sequence is one high and one low water, followed by a second high and low water of considerably less range, amounting at times to a few inches only.—*See Tide Tables for the Indian ports, published by Authority of the Secretary of State for India.*

† From observations made in the month of September.

‡ In South-east monsoon.   § In North-west monsoon.

‖ Only one high water in 24 hours, and very irregular. Range of 9 feet reported in August 1876.

¶ Generally, only one tide in the 24 hours. From April to October high tide occurs in the morning, from November to March in the evening.

§ Generally, only one tide in the 24 hours. From April to October high tide occurs in the evening, from November to March in the morning.

** With the tide rising at Surabaya, the streams flow inward at both ends of the strait ; the tide hour varies with the seasons, from 8h. at the equinoxes, to 12h. at the solstices. It is reported, that on 5th October 1892, two days after full moon, it was high water at 5h. a.m. and 5h. p.m.

Place.	High water, full and change.	Rise. Springs.	Neaps.
	h. m.	ft.	ft.
Madura Str.* (Sumenap B.)	10-12	5-8	2-4
Segoro Wedi B.	9 0	8-10	
Pachitan B.	3 0	7	
Chilachap Hr.	9 25	6?	4?
Chitando inlet	6 30	5	3½
Zand B.	5 0	4¾	
Wynkoops B.	5 0	5½	4
Bali.			
Bali Str., Banjuwangi	0 30?	9	
Badong B.	11 0	9½	
Tebuukus Rd.	5 0	6½	
Lombok.			
Ampenam B.	8 0	6	
Piju B.	noon?	10-12	
Sumbawa.			
Bima B.	noon.	6	
Sapeh B.	1 0	10	
Sumba or Sandalwood, North coast.			
Nangamesi Hr.	11 30	17	13½
Palmedo Rd.		15	
Timor, &c.			
Cyrus Hr. or Buka B., Rotti I.	noon.	6?	
Koepang	11 0	9	6½
Dilhi	1 0	6	
Babi I., Wetta passage	1 30	8	
Flores sea.			
Adonara, Flores		8	
Alligator B.		6	
Molucca sea, Celebes, &c.			
Bonthain (Bai'taeng) Rd., Celebes	9 0	8	
Bajoa (Bajowe) Rd., Celebes	noon.	9	5-6
Buton Str.	5-6	7½	
Sannana B., Sula Besi		9	
Limbé Str.		5	
Banka(Likupang)Str.	6 45	7	5½
Mauganitu B., Sangir I.	5 0	6	
Ternate	5 10	4	
Gebi, Fow I.		5	
Dampier Str.	6 0	11	
Wahai B. Ceram	6 0?	3-4?	
Buru, Kayeli B.	1 32	4½	
Amboina	0 30	8½	3½
Saparua I.	1 0	6	
Neira, Banda Is.	2 0?	9-10	
Ké Is. (Ke Dulan)	1 25	7	
Aru Is., Dobbo Hr.	2 30?	6	
Aru Is., Jei I.	4 20	5	3
Kulewatte B., Damma I.	1 0?	7	

Place.	High water, full and change.	Rise. Springs.	Neaps.
Borneo, China sea.			
	h. m.	ft.	ft.
Rendezvous or Kumpal I.		8	
Burong I.	4 45	7	
St. Pierre I.		4	
Tanjong Api		7	
Sarawak R., Moratabas entr.	4 0	9	5½
„ Santubong	4 0	10	6
„ Sarawak junction	5 0	15-18	9
„ „ City	5 20	15-18	9
Rajang R.	4 45	13	9
Bruit R.	3 0	11	
Bintula R.	5 45	6	
Bruni R. (Muara)	11 0	7¼	5½
Labuan I., Victoria Hr.	9 45	6	4½
Mangalum I.	11 0	5	
Kudat Hr.	10 0?	6-8	
Balambangan I., South Hr.	10 0	6-8?	
Banguey I., Mitford Hr.		7	
Tigabu	11 38	6½	?-2¾
Labuk B.	9 30	8	5
Sandakan Hr.	noon.	6?	1-4
Kinabatangan	11 17	5½	
Tambisan I.	10 52	3½	
Unsang, Tanjong	8 0	3½	
Dent haven	6 34	3½	
Silam Hr.	6 0	7¼	4
Sibuko B.	6 30	7½	4½
Batu Tinagat	6 0	8½	5¼
Strait of Makassar.			
Balabalagan (Little Paternoster Is.)	6 0?	8?	5?
Pamarung Is.	7 0	6-7	
Aru Pt.		7	
Makassar	4 40	5½	
Pulo Laut and Laut strait	6 7	7?	3-4
Baldbac island.			
Dalawan B.	11 0	5	
Kalandorang	11 0	6	
North Balabac Str.	10 50	5	
Palawan, West coast.			
Eran B.	10 10	6¼	
Teboyu B.	10 15	6	
Ulugan B.	9 30	5½	
Mayday B.	9 55	3½	
Port Barton, Bubon Pt.	10 55	6	
Pankol	9 40	6	

* The rise of tide is 7 to 8 feet at the solstices, and 5 to 7 feet at the equinoxes; the range of tide increases from the eastern part of Madura Strait towards the western part. Throughout the Eastern archipelago, the tides are largely affected by diurnal inequality.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Bakit B.	10 0	6	
Cavern I.	9 30	5½	
Observatory I.	11 0	5¼	
Paldwan, East coast.			
Ursula I.	11 0	7½	
Casuarina Pt.	9 30	6¾	
Port Royalist	11 0?	6½?	
Barren I.	9 30	5¾	
Karlandagan Is., Bird I.	9 30	6	
Tai Tai B.	9 30	5¾	
Busuanga	0 30	6	
Philippine islands.			
Port Sebú	noon.	7	
,, Buluagan Sta. Ana	noon.	5½	
,, Ilo Ilo	noon.	5½	
,, San Jacinto, Tikao I.	6 30	6	
Paluan B., Mindoro		5	
Port Laguinmauok, Luzon, S. C.	1 30	5½	
Manila, Luzon, W.C.	10 40	3½–6	
P. Subic	irr.	4¾ ||	
Port Sual, Luzon, W.C.		6	
Port Pio Quinto, Kamiguin I.	6 0	6	
Musa, B., Fuga I.		5?	
Alabat I., Luzon, E.C.	10 0	9	
Busainga (Burias I.)	0 30	6	
Nin B., Masbate	11 58	8½? 9¾?	Jan. July
Katbalogan, Samar I.	0 21	3–6¾	
P. Libas, Samar I.	6 10	3–7½	
Surigao Str.	9 30?	6½	4½
Davao, Mindanao	6 5	7	4
Sarangani Pt., Mindanao	7 0	6	
Pujaga B., Mindanao	6 0		
Palak Hr.	6 5	8	4½
Samboanga	6 54	4?	
Dapitan B.	3 40?	5	
Sulu sea.			
Cuyo	11 30	6	
Kagayan Sulu	6 10	6?	
Ubian I.†	6 15	5	
Dok Kan	6 0	5	
Pearl B.	6 5	5	
Sibutu	6 50	5	
Bongao, Tawi Tawi	6 40	6	
P. Siassi, Siassi I.	5 34	8½	
Sulu Rd., Sulu I.	7 38	3¾	
Dalrymple Hr., Sulu I.	7 50	4	
Basilan, P. Isabela	8 18	2?	
China sea.			
Paracel Is.	10 30?	8?	
Pratas Sh.	4 0?	5	
Batanes, Bashee Is.		4	

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
Formosa.			
	h. m.	ft.	ft.
Ta Kau Hr.	8 30	3½	1⅔
Anpei Anchorage	9 40	3¾	2¼
Port Kok si	11 30	3	
Wankan banks	10 0	10	5
Tongsiau	10 0	8–10	
Tam Sui Hr.	10 15	7–10	
Kelung Hr.	10 30	3	
Sauo B.	5 50	6	4½
Meiaco Sima group.			
Port Cockburn	7 32	6½	3
,, Haddington	6 45	7	
Karimata Anchorage	7 41	6¾	4¼
Liu Kiu islands.			
Kerama Chan.	6 43	5¼	4
Naha Ko, Nafa Kiang	7 4	7¾	4¾
Port Unteng	7 6	7¼	1½
Sesoko Byochi	7 6	7¼	4¾
Amami ō sima str.	6 34	6½	4¼
China sea (Malay peninsula.)			
Rumenia Pt.	10 30	12	9
Sidili R.	9 44	7	
Blair Hr.	8 50	9	
Tioman I.	6 0	7–8	
Kuantan R.		8?	
Anamba Islands.†			
Salat Paninsing (N.E. Group)	10 0	7½	4
Impul Passage (W. Group)	9 0	6	3½
(Gulf of Siam.)			
Tringano R.	8 0	7	
Patani Rd.	10 0	2½–3	
Singora	8 30	2–3½	
Lakon Rd.	10 15	4½?	
Chumpon B.	6 40?		
Menam R., Paknam	5 7	5½–9½	
Bangkok R. bar ‡	7 40	11 ‡	9‡
Bang-pak-kong R.	7 0?	9¾?	
Koh Sichang Hr.	6 30?	9¼–11¼	6¼–8
Cape Liant	5 7	6¼	
Chentabun R.	10 0	5½	
Pulo Panjang	7 0	2	
Rocky I.	4 0	4	
(Cochin China.)			
Pulo Condore	2 30	6½	
Mitho Rd.	3 50	11	7
Cape St. James	2 30	12½	
Saigon, city	4 30	12	
Kega Pt.	noon.	13–14	
Nhatrang B.	8 30	6	
Hon Kohe B.	11 30	6	

* Throughout the Eastern archipelago the tides are largely affected by diurnal inequality.
† Near the equinoxes there are two complete tides in each 24 hours, near the solstices only one tide in that time. When the sun has north declination the higher high water is in the day time, and at night when it has south declination. || Greatest range.
‡ Higher tides. For details *see China Sea Directory*, vol. ii.

Place.	High water, full and change.	Rise.	
		Springs.	Neaps.
	h. m.	ft.	ft.
Kin-hon Hr.	irr.	4¼–5¼	2–3¼
Tourane B.	9 30	4	
Hue R.	noon.	1⅝–5	
Hon Tseu	9 30	2–4	
Tong King gulf and Hainan island.			
Gaalong B., Hainan I.		4–5	
Yu lin kan B.	9 5	2¼	
Hainan bluff	10 35	6	4
Hoi Hau*	7 0?	6–10	
C. Kami	2 45?	9¾?	7?
	P.M. summer A.M. winter		
Pak Hoi	5 10?	14?	11?
Kao tao shan Is. (Gautau)	7 8		
Madeleine I.	5 0?	12–15	5–7½
Henriette pass	5 0?	10–12	4–6
Do Son	5 0	10½	
	P.M. summer A.M. winter		
Song Ka R.	5 0?	6–11	
Lach Tran	8 50	10	
,, Kuen R.	10 0	7–9	
Hon Gneu	11 0	9	
China, South-east coast.			
Nau chau passage	10 20?	12¾?	8?
Chukun	4 30	20	
Tien pak Hr.	noon.	8½	
Hui ling san	8 30	7½	
Namo Hr.	10 0	7½	
Boddam cove, Ladrone Is.	9 40	4½	
Broadway R. entr.	11 0	7½	
Taipa Anch.	10 0	7	
Macao	10 0	6½	
Canton R. entr.	10 0	8	
Kumsingmum Hr., Canton R.	0 6	6½	5½
Urmston Rd.	10 30	7	
Lintin I.	noon.	7½	
Fan si ak Chan.	1 0	7½	5
Junk Fleet entr., Canton R.	11 50	6½	
Tailung Chan., Canton R.	1 30	6½	
Wang-mun Chan., Canton R.	11 50	6½	5½

Place.	High water, full and change.	Rise.	
		Springs.	Neaps.
	h. m.	ft.	ft.
Junction Chau., Canton R.	2 0	6½	5½
Lankit I.	11 20	6½	5½
Chuen pi Pt.	noon.	7¾	
†Whampoa docks — March	1 40		
April	1 15	7–8	
May & June	0 30		
— March	2 40	5½	
Kuper I. off Canton city — May & June	1 40	5½	
Sep. Oct.	2 12		
Sam shui, Si Kiang or West R. — Feb.		5–6	
Shao king R.		3	
Wu-chau R.		1–1½	
Hongkong Rd.‡	9 0?	8?	6?
Taitam B.	9 10	8	8
Ninepin group	10 0	5	
Tide cove, Mirs B.	10 0	6½	
Tuui ang I., Bias B.	9 0	5½	
Hong hai B.	10 0	6½	
Chino B.	8 0	5	2½
Kupchi	7 45	5	4
Breaker Pt.	10 0?	8	
Haimun B.	9 0	6–7	
Cape Good Hope	9 0	6½	
Swatau (Double I.)	3 0?	6–9	
Clipper Rd., Namoa I.	11 15	7	
Chauan B.	11 0	6½	
Tongsang Hr.	11 30	12	
Chimney I., Rees pass	11 80	12	
Hut I.	11 20	14	
Makung Hr., Pescadores	10 80	9½	7
China, East coast.§			
Amoy, Inner Hr.	noon.	18½	14½
,, Chiang Chiu, West R.	3 40		
Hu i tau B.	0 15	16	
Chinchu Hr.	0 25	17	
Meichen Sd.	0 30	17	
Hungwha Chan.	11 25	23	
Haitan Str., Kerr I.	11 23	24	18

* The tides on the coast of Tong King are subject to a large diurnal inequality—one high and one low water generally occurring in the 24 hours.

† At Whampoa docks—In March, the day and night tides rise to the same level. From April to October, the day tides are the higher, and from November to February the lower. In May and June the level of spring tides is 4 feet, and the neaps 2 feet higher than in March.

‡ The range of tide is subject to a large diurnal inequality, and is also affected by the winds, which may increase or diminish the range by one foot or more. From October to March, the night tides rise the highest. From April to September, the day tides are the highest. The highest night tides (which occur between October and January) rise about one foot higher than the highest day tides (which occur from May to September).—*See Tide Tables for Hong Kong, published by the authority of the Government of Hong Kong.*

§ The tides on the coast of China are affected by diurnal inequality.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
White Dog Is.	10 22	20½	16	Wei hai or Kyau chau B.	5 0.	12	9
Min R., West Brother	10 32	19½	15½	Ching-tau B.	6 0	12	9
Pagoda Anch.	11 50	17½	14¾	Lo shan kau	4 30	11	9
Fuchau	0 40			Tau-tsui Hd.	3 20	12½	
Matsu	10 22	20½	16	Tsing-hai B.	3 0	9	7
Tang ki I.	9 30	17		Staunton I.	1 30	8	5½
Spider I.	10 0	17		Wang-kia B.	2 30	9	7
Lishan B.	10 15	16		Shihtau B.	1 30	9	7
Nam kwan Hr.	10 0	17		Sang-kau B.	0 55	7	4½
Tong hwang group, Bullock Hr.	9 30	19	14½	Aylen B.	2 30	6	4
Wen chau R. entr.	9 53	22	15	Litau B.	3 0	6	4
,, Snipe I.	10 15	22½	17	Shantung promontory	4 0		
Chin ki I.	9 20	13		Wei hai wei Hr.	9 30	9	
Tai chau Is.	9 0	14		Lung-mun Hr.	10 0	7	
St. George I., San-mun B.	10 20	15		Chifu	10 34	8	6½
Dai wan I., Kue shan Is.	8 35	13½		Hope Sd., Miau-tau group	10 24	6¼	
Nimrod Sd.	10 30	20		Miau-tau, Depôt B.	10 35	6	
Vernon Chan., Chusan Arch.	9 40	14		Charybdis Hr.	10 30	9	
Rambler Chan., Chusan Arch.	9 44	11–14	7–10½	Ta-tsing ho or Yellow R.	4 10	10½	8
Roundabout I. θ	10 2	13¾	8¾	Chi-Ho	4 0	10½	8
Ting hai Hr.	10 25	13	8¼	Peiho or Peking R. entr.§	3 30	10	7½
Chang tau	10 14	12	9	,, Tien-tsin	7 0	4½	
West Volcano I.	0 19	12	8¼	Peh tang ho	3 0	9	7½
Bonham I.	10 38	13	10–11	Sha-lui-tien banks, west part	2 50	10	8
East Saddle I.	11 0	14		Ching ho	1 20	6½	
Yung R., Chinhai **	0 14	11	8¾	Lau-mu ho	1 30	5	
,, Ning po fu	1 0	9		Tai-cho ho	0 15	6	
Hang Chu B., Seshan Is.		14		Yang ho	0 15	6	
Rambler I.	1 27	25–34		Ning-hai	noon.	6	
Haining town	3 0	19		Sand Pt., G. of Liau-tung	4 50	7	5¾
Hang Chu	3 0 ¿	6		N.W. Hd. of Liau-tung	5 30	10	8¾
,, Chapu Rd.	noon.	25		Liau Ho bar	4 0	11½	7½
,, off Can-pu		32		,, (Yin-koa)	5 0	12	
Gutzlaff I.	11 30	15		Vansittart Saddle	4 20	10	8½
Shaweishan I.	11 22	14	9¾	Hulu Shan B.	2 30	8	6
Yang tse kiang, Tung Sha L. V.	11 36	14	11	Society B., Suli-van B.	0 15	8	
*Wusung R. entr.	0 40	12–15	7¾	Port Adama, Mary I.	2 0	10	
Shanghai	1 30	10	7	Pigeon B.	11 45	8	
† Langshan crossing	1 40	12	8	P. Arthur	10 45	9 ?	
Chinkiang	8 30	3½	2¾	Ta-lien-whan B.‖	10 40	11	7
Nanking	11 0?	4?		Encounter Rk.	10 44	11	8
‡Kiu kiang		24–40		Haiyun-tau (Thornton haven)	9 30	12	8
Hankau		38–50		Chang-zu-do I.	9 30	12	8
Yellow sea.				Kwang-lo	9 55	12	8
Wang kia tai B.	6 0	12	9	Tu lu tau	9 30 ?	15	

θ Extraordinary springs rise 15 feet. ** North and north-east winds raise the level of high water 18 inches higher than usual.

* From about the middle of March to September, the a.m. tides rise higher than the p.m. tides; the reverse occurs during the other months.

† At Langshan crossing the tide rises for 3 hours only, and falls for 9 hours.

‡ Above Nanking, the rise is that of the freshets above the winter or lowest level of the river.

§ Time and rise much affected by winds.

‖ In August, the a.m. tides are the highest, at springs as much as 3 feet; the a.m. tides are also the lowest, but the difference is only a few inches.

Place.	High water, full and change.	Rise Springs.	Rise Neaps.	Place.	High water, full and change.	Rise Springs.	Rise Neaps.
	h. m.	ft.	ft.	Aburatani Hr.	10 25	3¾	2
Korea.				Setozaki Hr.	10 30	4¼	2¾
	h. m.	ft.	ft.	Hamada	0 17	1¾	
Ping Yang inlet, Dau Chen.	8 14	15½	9	Kaka Ura	1 20	1¼	?
Chel tau Anch.	9 25	20½	17½	Kasa Ura	1 20	1¼	?
Gets nai tau	6 18	14	10¾	Oki I. (Saigō)	3 16	1½	
Ta Tong R.	6 30	13		Shibayama	2 35	1½	?
Rooper Hr.	4 40	18	13	Tsuiyama	2 35	1½	?
Whitthall group	4 46 ?	25¼	21	Miyadsu Hr.	2 5	1	
Séoul R., Lundy I.	4 20	30		Maizuru	2 40	2½	
,, Poteunai*	7 20	16½ ?		Tsuruga	0 35	1	
,, Kam-pa-oui	7 50	1		Mikuni	2 0	2	
,, Seuk-kol	8 45	1		Sakai	2 0	1	?
,, Séoul	9 30	6¼		Wajima	1 41	1	?
Salee R.				Tsukumo Hr.	2 37	1½	?
,, Kheum Wolmi I.	4 42	29¾	24½	Nanao North Hr.	2 50	1¾	
,, Kapkoti	6 40	21¼	11¾	Niigata	3 10	1½	
Masanpho Hr.	4 51	30	22	Sado (Yebisu)	3 50	1	
Marjoribanks Hr.	3 30 ?	29		Aomori	4 0	2½	
Basil B.	4 15	18		Moura B.	3 57	2¾	1½
Kokuntau group	2 32	20	15	Shiranai B.	3 59	2½	1¾
Fire I.	2 0	18		P. Ominato	4 26	2¾	1¾
Gale B.	1 19	11		Yesashi		3½	
Washington Str.	10 38	8		Okusiri	3 30	1½	
Mackau I.	1 30	10¾		Oterranai	4 12	1¾	?
Murray Sd.	0 17	10		Risiri I.		4 ?	
Green Is.	11 0	12	8¾	La Perouse Str.	10 30	6	
Kuper Hr.	9 28	11½	8¼	Notsuke B.	4 50	4½	1½
Crichton Hr.	9 30	12	9	Nemoro Anch.	4 9	5½	3¼
Long Reach	10 0	14	9	C. Noshap	4 8	5¾	3½
Tracy I.	8 58	11½	8¼	Hamanaka B.	4 4	5¼	3¼
Hooper I.	9 10	11½	8¼	Akishi B.	4 30	5	
Port Hamilton	9 15	10¼	7	Hokodate Hr.	3 37	3½	1 ?
P. Touyon	8 34	7 ?		Endermo Hr.	4 35	5	
Tsu-sima Sd.	8 30	8	6	Shiriya Saki	4 15	3	2½
Itsuhara Hr.	8 50	6¾	4¾	Same Anchorage	4 40	4½	3⅗
Douglas inlet	8 47	7½	5¼	Miyako B.	3 35	3¾	
Fusan (Tsaulianghai)	7 45	7	5	Yamada Hr.	4 30	4	
Yung-hing B.	5 20	2½		Kamaishi		3 ?	
Port Lazaref, Broughton B.	5 20	2½		Ofunato Hr.	5 5	4	2½
Goshkevitch B.		3–4		Kinkawasan Chan.	5 30	5	3¼
Expedition B.	2 30	2½		Matsushima B.	5 30	4¾	3¾
Olga B.	5 30	3		Inuboye Saki	5 45	4½	3
				Kats ura	5 10	5½	4
Japan.				Tateyama B.	5 50	5	
Yama Gawa Hr.	7 32	9½		Yokohama†	5 45	5	3¾
Kagosima	6 50	10½		Uraga	5 35	5¼	3¾
Koshiki Is.	7 41	7¾	3–5	Fatsizio	6 0	5	
Ushibuka Hr.	8 20	8½	7	Ajiro	5 15	6½	4½
Sakitsu no Ura	8 0	9		Koajiro	5 18	6¼	4¼
Misumi Hr.	9 25	18		Port Simoda	5 45	7	4¼
Nagasaki Hr.	8 11	10¾	7	Mera Koura	6 1	5¼	3¼
Taskó	9 44	8½	5	Arari B.	6 0	6¼	4
Ojika Seto, Goto Is.	8 40	10¼	2–4	Yeno Ura	6 8	6	3¾
Goto Is.	8 40	10¼	2–4	Tago	6 0	6¼	4
Oösuka	9 15	8½	5	Shimidzu	6 8	6	3¾
Hirado Sima	9 15	8		Yokka ichi	6 30 ?	7 ?	
Iki		8		Matoya Hr.	6 50	6	
Yobuko	9 16	9	6½	Hamagema Ura	6 15	6	
Simonoseki	9 30	6	6	Owasi	7 0	5½	3¾
				Urakami	7 30	6	4
				Oosima	6 50	5	4

* In the river Séoul, spring tides rise from 22 feet at the entrance, to 6½ at Séoul.
† With southerly winds the tide rises about 2 feet higher.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
(Inland sea.)			
	h. m.	ft.	ft.
Tanabé, Kii Chan. .	6 0	6	5½
Yura-no-uchi .	6 0	5½	4½
Osaki B. . .	5 55	6½	
Hachken R. .	6 4	6½	
Tachibana Ura .	6 15	6¼	4½
Urado Hr. .	6 43	6½	4¼
Susaki and Nomi harbours	6 10	7	4½
Uwajima . .	7 32	6¼	3⅗
Yawatahama P. .	7 25	7⅞	5
Beppu B. .	7 17	7⅞	
Saiki B. . .	6 20	6⅚	4½
Yonodzu P. .	6 8	6	4½
Inokushi P. .	6 8	5½	4½
Aburatsu . .	6 3	5¾	4½
Hyogo and Kobe bays	7 34	6½	3½
Osaka R. entr. .	7 30	5¼	4½
Osaka city .	8 17	2¼	;
Yura Hr. . .	6 5	6½	
Naruto (Fukura) .	6 14	6½	4½
Benten Sima .	11 20	6	
Maiko fort .	6 27	3½	2¾
Nisi Sima .	10 15	6 ?	
Sakoshi B. .	10 10	5¾	4½
Wusimado, P. .	10 15	6	4½
Okayama, P. .	10 15	6	4¼
Haramura ura .	11 15	5¾	4
Awa Sima .	0 7	10¼	8¼
Shiaku .	0 16	9½	6½
Tomo Tsu .	11 37	13⅞	9
Takuma .	0 7	10½	6
Yuge Sima .	11 25	11½	8 !
Miwara .	10 37	11	8 ?
Hangata .	10 36	11½	8 ?
Mitarai pier .	10 10	13¼	9
Gogo Sima .	10 10	11	7¾
Hime Shima Rd.	9 12	11¾	7¾
Gulf of Tartary.			
Barracouta Hr.	10 0	3-4	
Castries B.	10 30	5½-8½	
Amúr Str.	11 40	5-6	
Dui Rd., Saghalin I.	9 52	6-8	
Sea of Okotsk.			
Tobootchi B., ,,	4 16	3	
Patience, cape ,,		6 ?	
Kuril Islands.			
Tomari B.	4 9	5¾	3½
Tokatan B. Urup	3 22	4¼	3¼
Paramushir Str.	6 53	5¼	
Kamchatka.			
Avatcha B.*	3 30	6¼	4½
Kamchatka R. entr.	4 0	6	

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
New Zealand : Stewart island.			
	h. m.	ft.	ft.
Mason Bay .	1 10	8	6
S.W. cape .	noon.	7	5
Port Pegasus .	11 50	8	6
,, Adventure	0 20	8	6
Paterson's inlet .	1 10	8	6
Port William .	0 45	8	6
New Zealand : South island, East and North coasts.			
Bluff Hr. .	1 18	8	6
Waikawa Hr. .	2 30	9	7
Catlin R. .	2 30	8	4
Molyneux R. .	3 0	8	6
Port Chalmers .	3 33	5½	4⅚
Dunedin .	4 2	5½	4⅞
Oamaru .	3 0	5-7	
Timaru .	3 30	6½	
Akaroa Hr. .	3 24	8	6
Port Lyttelton .	4 13	6¼	6
Kaikoura Penin. .	5 0	6	4
Cape Campbell .	6 0	8	6
Port Underwood .	6 10	8	6
Tory Chan. .	8 15	6-8	
Queen Charlotte Sd. entr.	8 50	8	6
Picton Hr. .	8 53	5	3⅞
Port Gore .	9 0	8	6
Pelorus Sd. entr. .	9 35	11	7
Rangitoto Rd. .	8 10	6-8	
Port Hardy .	9 55	12	
Croisilles Hr. .	9 0	12	8
Nelson .	9 50	14	10
Astrolabe Rd. .	9 10	14	10
Massacre B., Tasman corner	8 45	13	9
Massacre B., Motupipi R., W. entr.	9 50	14	10
Cape Farewell .	9 0	14	10
South island, South and West coasts.			
Ruapuke I., Foveaux Str.	1 0	8	6
New R., Oreti .	0 10	8	4
Centre I., Foveaux Str.	0 15	8	6
Preservation inlet .	11 20	8	4
Chalky inlet .	11 5	8	4
Dusky Sd. .	11 15	10	6
Duck cove .	10 50	10	6
Breaksea Sd. .	11 15	8	4
Daggs Sd. .	11 30	8	6
Thompson Sd. .	11 30	8	6
Charles Sd. .	11 15	8	4
Bligh Sd. .	10 45	8	6
Milford Sd. .	9 15	8	6
Haast R. Entr. .	10-50	5-8	

* The tides at Avatcha bay are affected by diurnal inequality.

Place.	High water, full and change.	Rise. Springs.	Neaps.
	h. m.	ft.	ft.
Okarito lagoon	11 40	9	
Hokitika bar	10 14	8¼	4½
Teremakau R.	9 55	9	
Grey R.	10 15		
Westport bar	10 20	9¼	5½
Cape Foulwind	11 15	6–8	
Wanganui inlet	9 20	7	6

North island, South and West coasts.

Place.	High water, full and change.	Rise. Springs.	Neaps.
Port Nicholson, Lambton Hr.	4 17	3¼	3¼
Mana I.	7 0	8	6
Porirua Hr.	7 0	8	6
Kapiti I.	9 0	6–8	
Manawatu R.	9 56	6	4
Wanganui R.	10 15	6–8	6
Opunake B.	9 45	10	7
New Plymouth (Taranaki)	9 30	12	9
Kawhia Hr.	9 30	12	
Aotea Hr.	10 0	12	9½
Whaingaroa Hr.	9 50	12	
Waikato R.	9 30	12	9
Manukau Hr. entr.	9 30	13	10
„ Te-Toro Pt., Waiuku R.	10 33		
„ cape Horn, Wairopa Chan.	10 50	14	5
Kaipara Hr. entr.	10 55	10	8
Hokianga R. entr.	9 45	10	7
„ Kohukohu	10 15	10	7
Cape Maria, Van Diemen	8 0	7	
Three Kings Is.	8 0	7	

North island, East coast.

Place.	High water, full and change.	Rise. Springs.	Neaps.
Cape Palliser	6 0	6	
Napier (Ahuriri Hr.)	6 15	3–1	
Mohaka R.	6 40		
Wairoa R.	6 45	7	4
Waikokopu	6 30		
Long Pt.	6 0	5	4
Poverty B.	6 5	6	
East C.	8 55	7	
Hicks B.	9 0	7	
Cape Runaway	9 13	7	
Te Kaha Pt.	6 30	9	
Opotiki R.	7 0	7	
Tauranga Hr.	7 10	6	4½
Mercury B.	7 21	7	5
Mangrove R.	7 21	7.	5
Gt. Barrier I., Nagle cove	6 25	10	7
Coromandel Hr.	7 0	8–11	
R. Thames, entr.	7 45	11	8½
Auckland Hr.	7 32	11	9

Place.	High water, full and change.	Rise. Springs.	Neaps.
	h. m.	ft.	ft.
Kawau I.	6 30	10	7
Mahurangi Hr.	7 0	10	
Whangarei Hr.	7 0	9	7
Tutukaka Hr.	7 0	9	7
Whangaruru	7 10	9	7
Bay of Islands, Motumea islet	7 15	9	6
Whangaroa Hr.	8 15	7	
Cavalli Is.	8 0	7	
Mangonui Hr.	8 0	7	5
Awanui R. Rangaunu	7 44	7	
Paraunga renga Hr.	7 54	7	

Australia, East coast.*

Place.	High water, full and change.	Rise. Springs.	Neaps.
Twofold B.	8 15	5–7	
Panbula R.	9 0	4–6	
Montagu I.	8 30	5–7	
Bateman B.	8 0	4–6	
Ulladulla Hr.	8 30	6	
Jervis B.	8 30	5	
Shoalhaven R.	8 30	6–9	
Port Hacking	8 45	7–8	
Botany B.	8 10	7–8	
Port Jackson, North Hd.	8 15	6	
Sydney†	8 38	5½	4
Broken B.	8 30	5–7	
Newcastle or P. Hunter	8 50	4–5½	3–4
Port Stephens	8 30	6	4
Manning R.	9 15	4	
Crowdy Hd.	9 15	5	3
Port Macquarie bar	9 15	4	3
Mac Leay R.	9 15	5	3
Solitary Is.	9 15	5	3
Clarence R., South Hd.	8 30	4	
Richmond R., entr.	9 0	3½	
Cape Byron B.	8 45	5	
Tweed R., Danger Pt.	9 30	6	4½
Moreton B., Comboyuro Pt.	9 30	4–7	
Head of Moreton B.	11 0	6	
Brisbane	11 0	6¼	
„ the Quarry	10 30	6¼	
„ at the Bar	10 5	7	5½
Toorbul Pt.	9 45	6–8	
Wide B.	8 30	6	
Gt. Sandy Str., Hook Pt.	8 30	6	
„ Woody I.	9 14	10	7
Mary R. entr.	9 45	9–12¾	7–10
Sandy C.	8 50	6–8	
Hervey B., Ship Chan.	9 14	10	7
Burnett R.	9 30	8–9	3–4
Port Curtis	9 30	10–12	
Cato I.	8 0	6	

* From April to October, the night tides are higher than the day tides, and the reverse for the rest of the year. The usual sequence of the tides is from the lower low water to the higher high water.

† In June and July, the night tides are at times nearly 2 feet higher than the day tides, and the reverse in December and January. It is stated that the highest tides occur with westerly-winds.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.				
Wreck Rf., Bird islet	8 3	6		*Torres strait.†*			
Lady Elliot islet	9 0	7-8			h. m.	ft.	ft.
Heron islet, Capricorn group	9 0	10		Bramble cay	9 15	12	
Keppel B.. Pilot station	9 0	9-14		Darnley I.	9 30	12	
				Murray Is.	9 30	10	
Rockhampton	noon.	9-10	6½-8	Adolphus I.	9 30	10	
Swain Rfs.	8 30	7 ?		Albany I. (Frederick Pt.)‡	11 0	10	8½
Saumarez Rf.	8 0	6		Turtle-Backed I.	9 15	10	
Frederick Rf.	8 0	6		Thursday I.	9 30	10	
Kenn Rf.	8 0	5½		Normanby Sd.	irr.	12	4½
Middle Bellona Rfs.	8 30	6					
Avon isles	8 30	5		*Australia, North and North-West coasts.†*			
Mellish Rf.	7 55	5-6					
Port Clinton	10 25	11-15	12	Endeavour Str., E. entr.	1 0	9½	
Shoal Water B.	11 30	19-22	16	Wallis I.	irr.	7	
Thirsty Sd.	10 45	20-22	17	Cape Possession	9 0	6	
,, S.W. entr.	11 50	30		Possession I.	1 0	9½	
Broad Sd., Long I.*	11 35	22-26	15-19	Booby I.	1 0	8	
,, St. Lawrence Ck.	11 55	18-23	13-17½	Norman R., Jan. p.m.	7 30	12	7
,, Roundish I.	11 50	23-28	15½-20	,, Jul. a.m.	7 30	8	5
Percy isles	10 30	16	13	Albert R.	8 0?	10-13	3-8
Guard Fish cluster	11 20	14-18		Wellesley isles, Investigator Rd.	8 0	9	
Pioneer R.	11 15	16-18	11-13	Sir E. Pellew Is.	7 30	7	4
P. Newry.	11 15 ?	12?		Beatrice islet	3 0	8	
Repulse Ids.	11 0	18		Cape Wilberforce	8 10	10	
Cape Conway	11 0	18		Arnhem B.	8 10	6	
Thomas I.	11 5	21		C. Stewart	7 30	14	8
Molle P.	11 11	12½		Liverpool R.	6 30	12	
Whitsunday Is.	10 17	6-10		Goulburn isles	6 0	5-6	
Gloucester passage	10 20 ?	9		PortEssington,(N.W.)	3 24?	13	
Port Denison	10 20	8-10		East Alligator R.	8 15	15	
Upstart B.	9 6	6-10	6-8	Adam B.	6 0	18	
Cleveland B.	9 25 ?	8-12	5	Adelaide R., entr.	5 30	17	12½
Palm isles		8-10	4-8	Shoal B.	6 0	18-25	10-15
Hinchinbrook chan. S. entr.	9 15 ?	9-11		Port Cockburn	5 45	14	
Goold I.	9 35	8-11	7½	Port Darwin	5 43	22½	15½
Mourilyan Hr.	9 0	8-10	7-8	,, Patterson	4 0	13-20	6-12
Fitz-Roy I.	9 15	7-12	5-7	,, Keats	6 0	22	
Cairns Hr.	9 30 ?	8-10	5-7	Pearce Pt.	6 55	20-26	10-18
P. Douglas	9 15	7-8	5-7	Victoria R., Turtle Pt.	7 15	15-24	
Trinity opening, Great Barrier Rfs.	9 15	7-12		,, Holdfast reach	9 0	16	10
Weary B.	9 15	7-10		,, Mosquito flat .	0 19	7-13	
Endeavour R. (Cooktown)	9 0	6-9		,, Sandy I. .	1 17	3-10	
Low Wooded I.	8 41	9	4-6	Lacrosse I.	6 33	18-24	14-17
Lizard I.	9 0	7-9	7	Wyndham, Hd. of Cambridge G.	8 15	23	
Willis islets	8 0	6	6	Reveley I.	6 33	15-17	12
Osprey Rf.	8 36	6		Baudin I.	11 31	19-22	12-15
Flinders group	9 15	8-12		Swift B.	noon.	18	
Night I.	8 40	7-9	6½	Prince Frederick Hr.	noon.	28	
Restoration I.	9 10	7-9	6¾	Port Nelson	noon.	27	
Cape Grenville	9 15	10		Careening B.	11 45	30	
Sir C. Hardy Is.	9 15	10		Prince Regent R., St. George basin	0 20	24-37	
Hannibal Is.	9 50	10-12	9-10	Hanover B.	11 30	24-38	
Tern I.	10 20	10-13	10				
Raine I.	8 10	10					

* From July to September, the night tides were two to four feet higher than the day tides, but in October and November, the day tides were the same amount higher.

† The tides are largely affected by diurnal inequality.

‡ The diurnal inequality, amounting at times to 4 feet, chiefly affects the high waters. The highest tides frequently occur a day or more before full and change of the moon.

∥ One tide in 24 hours, time of high water full and change being 2 hours earlier each month. Highest tides occur when moon has maximum declination.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft
Camden Sd.	11 30	30		Swan I.	9 16	7	
Beagle Bk.	10 0	12		Eddystone Pt.	8 10	7	
Montgomery isles	noon.	36		George B.	9 42	3	2
Collier B.	11 45	36		Spring B.	7 30	4–5	3–3½
P. Usborne, King Sd.	1 45	34		Port Arthur	8 20	4½	
Fitzroy R. entr.	2 30	36	20	Parsons B.	7 48	4½	3½
Swan Pt.	0 10	26		Hobart	8 15	4½	3½
Beagle B.	noon.	17½	12¾	D'Entrecasteaux Chan.	7 30	4½	3½
Lacepede Is.	noon.	20		Macquarie Hr.	7 30	3	
Carnot B.	11 0	18					
Roebuck B.	11 0	28					
Turtle isle (North)	11 0	18	12				
Oyster inlet	10 35	18		*Bass strait.*			
Depuch isle	10 40	14	10	King I. :†			
P. Walcott	11 43	18		,, Franklin Rd.	0 48	3	
P. Robinson	11 15	19		,, Sea Elephant B.	0 50	3	
Dampier Arch.	11 30 ?	16–17		King I., Surprise B.	0 43	3	
Hermite isle	10 0	14		Hunter I.	10 30	8	
Hampton Hr.	10 30	14½	9¾	Three Hummock I., E. side	11 30	8	
Fortescue Rd.	10 25	13½	8½	Kent group	10 15	8	
P. Weld	noon ?	10–12		Flinders I., W. side	10 30	10	
Beadon	4 30 ?	7–8		Goose I.	10 48	9	
				Armstrong Chan., Banks Str.	10 36	5–7	
*Australia, West coast.**				Babel Is.	10 5	7	
Sharks B., Naturaliste Chan.	11 45	6					
,, Gascoyne Rd.	10 15	3½	2	*Australia, South coast.**			
,, Denham Sd.	0 5	5					
,, Freycinet reach	3 0	5		Gabo I.	8 50	6	
,, ,, estuary	4 15	3½		Entr. to Gipps land lakes	8 30	3	
,, C. Perron	0 45	5½		Corner inlet, Rabbit I.	0 14	8	
,, Hamelin pool	5 0	3½		Refuge cove	0 5	8	
Port Gregory	11 30	3		Glennie isles	11 44	9	
Houtman rocks	11 30	2½		Waratah B.	noon.	8	
Champion B.	9 0	1¾	1¼	Venus B.	11 56	7	
Port Grey	9 0	1–1½		Western Port, Mussel Rk.	0 12	8½	6½
Jurien B.	9 0	2	1½	,, Bourchier Chan.	1 13	10¾	8¾
Rottnest I., Thompson B.	7 50	2¾		,, French I., spit.	1 0	10	8
Swan R., Gage Rd.	8 50	2¾		Port Philip, Lonsdale Pt.	9 42	7	5¼
Cockburn Sd.	9 0	1–1½		,, entrance	2 0 approx.		
Warnbro' Sd.	9 0	2 ?	1½				
Koombanah B.	9 0	2		,, Dromana	2 19	3	2½
Busselton	9 29 ?	2½	2	,, Schnapper Pt.	2 14	2¾	2
Hamelin B.	9 49	2¾ ?	2	,, Bellarine jetty	2 21	2½	2
Flinders	10 35	2¾		,, Geelong, Bird Rk.	2 30	3½	2½
				,, Henry Pt.	2 39	3	2½
Tasmania.				,, Williamstown	2 31	2¾	2
Circular Hd.	11 40	9					
Mersey R. ent.	11 15	9					
Tamar R. Pilot station	11 10	10	7½				
,, Launceston	1 0	12½					
Waterhouse I.	10 16	8					

* The tides are greatly influenced by the winds. During north-westerly gales the water remains about 3 feet above its ordinary level ; this occurs all along this coast, and round cape Leeuwin.

† Tidal streams are affected by the winds, and are uncertain.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Port Melbourne, quay near the bridge	2 48	2¾		Blanche P., Streaky B.	0 5	6	
Lady B.	0 37	3		Denial B.	0 50	7	
Port Fairy	0 31	3		St. Francis isle, Petrel B.	noon.	6	
Portland B. a	0 30	3 f		Port Eyre	noon.	5½	
Part Macdonnel	0 2	4		Eucla Rd.	11 5	5	
Rivoli B.	0 33	4		Esperance B.	0 10	3-4	2-3
Guichen B.	0 37	4		King George Sd., Princess Royal Hr.‖	11 3	2¼	2
Kingston	0 6	5		West Cape Howe	9 0	2	
Murray R.,‡ bar	0 50	3-4	2-3				
Victor Hr.	1 9	4¾		*Islands in South Pacific.*			
Gulf of St. Vincent:—							
*Hungry Pt., Troubridge shoals	4 18	7	4-6	Sala-y-Gomez	4 0	4 ?	
Black Pt.	4 37	8	5-6	Easter I.	0 39	irr.	
Port Alfred	4 37	8	5-6	Rapa I., Ahurei B.	0 10	3	
,, Wakefield	4 40	11	5-6	Tubuai I.	.	3	
,, Adelaide	5 25	8	4½	Rarotonga	6 0 ?	3½ ?	
,, †Semaphore jetty	4 40	7¼	4	Suvaroff (Suwarow) Is.	3 10?	3	
,, Noarlunga	4 0	6		Penrhyn I.	6 0 ?	1½	
,, Willunga	4 0	6		Caroline Is.	4 0	1½	½
Yankalilla	3 30	6					
Kangaroo I.:—				*Paumotu or Low archipelago.*			
Cape Willoughby	4 10	6		Gambier Is., Rikitea	2 30	4	
Autechamber B.	2 15	4-5		Bow I.	2 40	3	
Pelican lagoon	4 0	4		Rahiroa (Nairsa I.)	4 30	2¾	
Investigator Str.:—							
Marion B.	2 5	4		*(Society islands.)*			
Spencer gulf:—				Tahiti or Otaheite I.	noon.	1¼	
Gambier Is.	2 0	5		Teavarua Hr., Raiatea I.	irr.	1	
Thorny passage	noon.	6-8		Owharre Hr., Huaheine	.	1	
Port Lincoln	1 50	6		Otea, Vanna Hr., Bora Bora	irr.	2	1
Salt Creek cove	3 30	6					
Hardwicke B.	2 45	4-6		*(Marquesas islands.)*			
P. Victoria	2 40	5					
Wallaroo B.	5 45	4¾		Resolution B., Tauata	2 30	4	
Franklin Hr.	4 0	5¼		Comptroller B., Nuku Hiva	3 52	4¼	
Plank Pt.	6 15	6-8		Anna Maria B., Nuku Hiva	3 50	4¼	
P. Pirie	7 15	8-12					
Webling Pt.	6 10	6-9					
Pt. Lowly	7 0	6-8					
P. Augusta§	8 30	12					
Coffin B.	0 45	6					
Venus Hr.	1 30	4-5					

a The tide, as regards its rise and fall, is greatly dependent on the winds ; the ordinary rise is about 3 feet.

* From observations made between Feb. and May 1868.

† During the summer months the a.m. tides rise higher than the p.m. ; in the winter months the reverse is the case. The neap tides are very irregular.

‡ From September to March, high tide occurs in the night or morning ; and from March to September, in the day or afternoon. The time of high water only varies two hours from that at full and change (0h. 50m.), ranging from 11h. when the moon's age is 10 or 26 days, to 3h. when the moon's age is 20 or 7 days. High springs sometimes rise 6 feet.

§ When the wind shifts from West to the southward and blows strong, the rise has been as much as 16 feet.

‖ Large diurnal inequality, which sometimes reduces the two daily tides to one.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
				Nelson B., Epi. I. .	6 10	5 ?	
				Ringdove B., Epi I. .	6 10	5	3¾
				Sakau, Maskelyne Is.	5 30	5 ?	
(Navigator islands, &c.)				Port Sandwich,) Malekula	5 20	4¾	3¾
	h. m.	ft.	ft.	Rano I. (Malekula I.)	5 9	4¾	4
Pango Pango . .	7 11	3½		P. Ravellec,) Malekula .	5 50	4–5	
Upolu I. (Apia) .	6 30	4¼					
Manua . .		6		Dip cove, Ambrym I.	6 0?	5 ?	
Uea or Wallis I. .	6 40	6 ?		Craig cove, ,,	6 0?	5 ?	
Rotumah I. . .	4 40	7	4¾	Rhanone, ,,	5 55	4 ?	
Phœnix Is., Canton I.	5 0	4 ?		Marina I. (P. Lau-) tour)	6 11	4	
Funafuti, Ellice Is. .	5 20	6¼	4?				
				,, Clemenceau) Pt.	5 46	4¾	
(Tonga or Friendly islands, &c.)				Espiritu Santo I. .	6 19	3¾	3
Nukualofa, Tonga-) tabu ¶ . .)	7 0	4¾–5¾	3–4¾	Narovo Rovo, Aurora	6 0	5 ?	
Nomuka . .	7 15	3½–4¾		Banks Is., P. Patte-) son, Vanua Lava I. (	6 40	5	
Lefuka . .	7 17	5	3¾	Santa Cruz Is. . .	4 50	4–5	
Vavau . .	6 20	5					
North Minerva .	8 0	6		*(New Caledonia.)*			
South Minerva .	8 0	6					
				Wreck B., Lifou I.,) Loyalty Is. .)	6 30	5–6	
(Fiji islands.)				Port Alcmène, isle) of Pines .)	8 6	4	
Vatoa or Turtle I. .	6 11	4					
Tova or Na Vatu Rf.	6 8	4		Prony B. . .	8 10	2	
Mango I. . .	6 10	4¾		Noumea B. . .	8 25	4	
Matuku . .	6 18	5	3	Port St. Vincent .	5 50	4½	
Totoya . .	6 37	4½		Burai B. . .	8 39	2¼	
Moala . .	5 50	5		Taulee B. . .	8 4	4½	
Ngau I. . .	6 7	5	3¾	Devarenne Str. .		3½	
Nairai I. . .	5 53	4½	3¼	Port Balad . .	6 15	4½	
Ovalau . .	6 0	5	3	,, Puebo . .	4 26	4	
Makongai and) Wakaya Is. .)	6 0	4	3	,, Yengeu . .	6 15	4½	
Nandi passage & B. .	6 35	4½		,, Uinne . .	6 48	4	
Sandalwood B. .	6 0	6?		Fabre I. . .	5 40?	6?	
Viti Levu, Mban) roads (	5 45	6		*(Solomon islands, New Guinea, &c.)*			
,, P. Nukulau .	6 47	3½–5¾					
,, Suva Hr. .	6 55	4½–5¾	3½–1	Ugi I. . .	5 30	4½	
,, Nadronga .	6 0	5–6		Malaupaina I. . .	3 25	3–4	2–3
,, Likuri I. .	6 30	4½	3¾	Hada (Recherche)) B., San Cristoval I. (	9 0	4–6	
Manava sand cay .	6 2	6¼	3–4				
Vanua Levu, Savu) Savu B. (	6 0	4½	3½	Makira (Leoué) B.,) San Cristoval I. (	6 45	2	
,, Valanga B. .	5 55	5¾	4	Owa Raha (Sta.) Anna) I. .)	6 10	4–5	2½–3½
Ngaloa B., Kan-) davu I.)	6 38	5½	4½	Marau Sd., Gaudal-) canar I. .)	10 0	3½	
Ono I. . .	6 0	6	4½	Mboli Hr., Florida I.	5 30	6 ?	
				Gavatu I., Florida I.	irr.	3½‡	
(New Hebrides.)				Anki I. harb., Malaita	9 0?	5 ?	
				Vulavu, Isabel I. .	4 0?	4–5	
Port Inyang, Anei-) tyum .)	6 35	4		Marovo lagoon,) New Georgia .)	irr.	4‡	
,, Resolution,) Tanna I. .)	5 35	3		Kula gulf, New) Georgia .)	irr.	3‡	
Erronan or Futuna .	7 24	4		Narovo I. (Eddy-) stone) . .)	6 0?	1½–2	
Dillon B., Erro-) mango I.)	5 30	4		Guizo I. . .	irr.	6 ?	
Metensa B., Efate I.	6 30	4	3½	Mono (Treasury) I. .	2 24?	2–3	
Fila Hr., Efate) (Sandwich) I.)	6 30	4	3¼				
Havannah Hr. .	6 30	4	3¼				
Mai I. . .	6 30	5					

¶ Two tides of unequal range occur in the 24 hours, in the following order :—Highest high water, lowest low water, lesser high water, lesser low water.

One high and one low water in the 24 hours. ‡ Extreme range.

Place.	High water, full and change	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.				
Roncador Rf.	3 30	6?					
Segaar B., New Guinea	6 30	6	4				
Kabobotol Str.	6 0	4–6		*(Gilbert islands.)*			
Boni Hr., New Guinea	5 0	6			h. m.	ft.	ft.
Triton B., New Guinea	1 8	7		Apamama	4 30	6	
Dourga str., New Guinea		12–16		Tarawa	4 0	6	
Dewinka R. ,,	12 0?	16?					
Kiriwina (Trobriand) Is.	5 0?			*(Marshall islands, &c.)*			
Fow I.		5		Ailuk, Kapenuir I.	4 53	8	
Rook I.	0	3?		Wotje or Romanzoff Is.	2 30	7	
Togula, Louisiade Arch.	25	5½	3	Arhno Is.	4 45	6?	
Woodlark I. ,,	7 15	4		Port Rhin, Mulgrave Is.	5 0	6½	
Suloga Hr.	irr.	2–3		Bonham Is., Anch.	3 30	6	
Duchateau Is.* ,,	9 0	5	3½	Ebon atoll	4 45	6	
Calvados chain	9 0	5	3½	Menschikoff Is.	4 0	5½	
Joannet Hr., Louisiade Arch.	10 0	6	4½				
Prince inlets, New Guinea	10 30	14	10	*(Caroline islands.)*			
Hall Sd.	9 15	5–7	2–3	Yap I.	7 15	4½?	
Port Moresby, New Guinea	9 12	9	6	Narmaur I., (Ponapi I.)	3 0	6	
Su-a-u Hr.	9 30?	8½?		Port Metalanim (Ponapi I.)	4 20	3–4½	
China Str. ,,	8 40	6	3?	P. Santiago	4 5	4	
Ward Hunt Str. ,,	5 0	2½?		Kusaie (Ualan I.)	6 0	4½?	
Fortescue Str. ,,	8 0	4–5					
Goschen Str. ,,	8 0?	5?		*(Ladrone islands.)*			
Killerton Is. ,,	11 30	3½?	2	Saipan I.	6 45	2½	
Bira Bira B. ,,	9 0	5¼	3½				
Tiwan I., New Guinea	11 30	12		*(Sandwich islands.)*			
Port Carteret, New Ireland	irr.	6?		Kealakekua B., Hawaii	3 49	2?	
Holz haven, New Ireland	2 50	3¼		Maui I.	3 0	3	
Blanche B., New Britain*	9 0	2¾	1½	Molokai I.	3 15	2½	
Matava B.†	mid.	3½		Honolulu, Oahu	3 40	2–3	
Makada Hr., Duke of York I.	9 10	2½	1	Kauai I.	3 45	2½–3	
North haven, New Hanover	2 30	3					
Lord Howe I.	8 30	6		*(Bonin islands.)*			
Elizabeth Rf.	8 30	8	5	Port Lloyd, Peel I.	6 8	3	
Middleton Rf.	8 30	6		New P., Hillsborough I.	11 32	3½	
Norfolk I.	7 45	5		Pelew Is.		6	
Raoul or Sunday I., Kermadec Is.	6 0	5					
Chatham Is., P. Hutt	5 0	4–5		*South America, Magellan strait.*			
Antipodes Is.	3 30	6?		Sarmiento Bk.	8 10	36–42	
Auckland I., P. Ross	noon.	3		Cape Virgins	8 30	36–42	
Campbell I., South or Perseverance Hr.	noon.	3½		Dungeness	8 30	36–41	30
				Capo Espiritu Santo	8 30	36–42	
Islands in North Pacific.				Catherine Pt.	8 5	30	
Fanning I.	6 15	2		Possession B.	8 35	36–42	
Palmyra I.	5 5	3		Direction hill	8 53	38	23
Christmas I.	4 23	3¼		First narrows	9 0	36–42	
Howland I.	7 11	8		Philip B., E. side	9 30	24	
Midway Is.	3 28	1½	1				

* From April to October, highest tides occur at night, and during the day for the rest of the year.
† One high and one low water in the 24 hours.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
St. Jago B. . .	9 27	20	15
Triton Bk. . .	9 0	15	
Gregory B. . .	9 30	21	12
Second narrows .	10 0	23	
Gracia Pt. . .	10 17	8	
Oazy Hr. . .	10 18	7	6
Pecket Hr. . .	9 30	7	6
Royal Rd., Eliza- beth I. . .	9 47	8	
Sta. Magdalena I. .	noon.	10	
Laredo B. . .	11 0	7	
Sandy Point Rd. .	noon.	5	4
Port Famine . .	noon.	6	
Cape San Isidro .	1 0	8	
St. Nicholas B. .	0 50	6	
Port San Antonio .	noon.	7	
Labyrinth Is. . .	0 30	5½	
Woods B. . .	0 34	8	
Port Gallant . .	0 34	8	
York Rd.. . .	2 0	9	
Tilly B. . .	1 30	6	
Borja B. . .	1 15	5	
Swallow B. . .	1 17	5	
Snowy Chan. . .	1 0 ?	4	
Playa Parda cove .	1 8		
Port Angosto . .	0 40	4	
Sylvia cove . .	1 0 ?	4	
Port Tamar . .	1 40	6	
„ Churruca . .	1 0	6	
Tuesday B. . .	1 0	6	
Port Mercy . .	1 22	4	
Cape Pillar . .	1 0	4	

Smyth, Sarmiento, Wide, and Messier channels.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
Sholl B. . .	11 45	6	
Goods B.. . .	0 30	7	
Fortune B. . .	0 50	7	
Isthmus B. . .	1 30	5	
Welcome B. . .	0 50	7½	
Victory pass . .	1 25	6	
Mayne Hr. . .	1 40	6	
Puerto Bueno . .	0 24	8	
Guia narrows . .	2 10	8	
Wide B. . .	0 15	4 ?	
Molyneux Sd. . .	11 30 ?	3 ?	
Portland B. . .	noon.	4	
Tom B. . .	noon.	4	
Kathleen Anch. .	noon.	6	
Cockle cove . .	11 45	5	
Alert Hr. . .	0 15	7	
Flotten Hr. . .	0 50	5	
Ringdove inlet .	0 40	5½	
Fury cove . .	1 15		
Port Riofrio . .	0 15	6	
Eden Hr.. . .	0 15	6	
English narrows .	0 15	6	
Port Simpson . .		6 ?	
Halt B. and Gray Hr.	0 15	6	
Middle I.. . .	noon.		

Tierra del Fuego, South-west coast.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Diego Ramirez Is. .	4 0	6	
Cape Horn . .	3 40	9	
St. Francis B. . .	4 0		
St. Martin cove .	3 40	8	
Middle cove . .	3 30		
Nassau B. . .	4 0	6	
Goree Rd. . .	4 0	8	
Lennox cove . .	3 40	8	
Good Success B. .	4 3	6-8	
Ushuwaia . .	3 58	7	
Packsaddle B. . .	3 30	6	
Orange B. . .	3 36	9 ?	
New Year Sd. . .	3 30		
Adventure cove .	3 10	4	
March Hr. . .	3 10	6	
Doris cove . .	3 0	4	
Stewart Hr. . .	2 50	4	
Townshend Hr. .	2 30	5	
Fury Hr. . .	2 30	4	
North cove, Fury I.	2 30	4	
Hewett B. . .	0 30	6½	
Bedford B. . .	0 30	7½	
Smyth Hr. . .	noon.	6½	
Noir I. . .	2 30	5	
Laura B. . .	1 0	6	
Cape Gloucester .	1 30	5	
Latitude B. . .	2 5	4	
Week Is. . .	2 0	5	
Dislocation Hr. .	1 40	4	

Patagonia, West coast.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
Evangelists . .	1 0	5	
Port Henry . .	noon.	5	
Deutsche narrows .	0 18	2½	
Port Barbara . .	0 28	6	4

Chonos archipelago.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
San Tadeo R. . .	11 45	6	
Port Otway . .	11 37	6	
San Andres B. . .	0 45	5	
Port San Estevan .	0 15	5	
Anna Pink B. . .	0 45	5	
P. Yates . .	10 35	10	
Vallenar Rd. . .	0 18	5	
Darwin channel .	0 35	10	
Port Low . .	0 40	7	
Harchy B. . .	1 30	10	
Port Lagunas . .	1 10	7	
Port Chacabuco .	1 15	7	
„ Perez . .	1 12	7½	
„ Tangbac . .	11 40	10	
Port San Domingo .	noon.	7	
Piti-Palena . .	0 23	10	
Tictoc B.. . .	1 45	11	

Place.	High water, full and change.	Rise Springs.	Rise Neaps.	Place.	High water, full and change.	Rise Springs.	Rise Neaps.
Chiloe archipelago.				Carrisal Bajo B.	8 30	5	
	h. m.	ft.	ft.	Copiapo	8 30	5	
Hnafo I.	noon.	7		Esmeralda cone	9 20	5¼	
Cucao B.	noon.	6		Port Flamenco	9 10	5	
Port San Carlos	0 14	6		Lavata B.	9 20	5	
Carelmapu	0 50	10		Paposo	9 40	5	
Petucura Rk.	0 50	16		Grande Pt.	9 15	5	
Chacao B.	0 40	14		Blanco Encalada Rd.	10 0	3½	
„ narrows	0 50	16		Constitucion cove, Moreno	10 0	4	
San Pedro passage	0 30	9		Mejillones del Sur B.	9 45	4	
P. Quellon	0 40	14¾		Cobija B.	9 54	4	
Huildad inlet	0 48	16–20		Paquica or C. San Francisco	9 45		
Talcan I.	1 3	15½		Chipana B.	9 19	5?	
Poqueldon Hr.	0 54	18		Iquique	8 45	5	
Castro	0 11	18		Lobos C.	8 0		
Dalcahue	0 26			Arica Rd.	8 0	5	
Chauquis Is.	0 35						
Quicavi bluff	0 57	20		*Peru.*			
P. Linao	0 24	8		Ylo Rd.	8 15	6	
Manao B.	0 7	7		Islay	8 53	7	
Oscuro cove, Huit?	0 54	10		Quilca R.	8 0	6	
Lobos Hd.	0 29			Atico Rd.	8 53	5	
Huapilinao Hd.	1 25	15½		Lomas I.	8 19	5	
Tres Cruces Pt.	1 15	16		Port San Juan	5 10	3	
				„ San Nicholas	5 15	3	
Chile.				Independencia B.	4 50	4	
Comau inlet	1 10	17	13¾	Pisco B.	7 0	3–4	
Cullen L.		20		Cerro Azul B.	5 0	3	
Reloncavi inlet, Sotomo B.	0 55	18		P. Chilca	5 30?	4?	
Port Montt	0 48	18–20	14–15	Callao B.	5 47	4	
Puluqui I.	1 5			Huacho B.	4 45	3	
Calbuco	1 22	15–20		Supé B.	4 50	3	
Port Abtno	1 18	16–18		Huarmey B.	6 0	2	
Maullin R.	0 30	8		Samanco or Huambacho B.	6 30	2	
Port Corral	10 35	5¼		Ferrol B.	5 50	2	
„ Valdivia	11 35	4		Malabrigo Rd.	5 0	2	
Tolten R.	10 28	5		Eten Pt.	4 0	3	
Mocha I.	10 30	3		Lambayeque Rd.	4 0	3	
Lebu R.	10 30	5		Port Paita	3 20	6	
Santa Maria I.	10 20	6		Malpelo Pt.	4 0	10	
Arauco B.	10 0	5					
Talcahuano	10 15	5¼	3¼	*Ecuador.*			
Buchupureo Rd.	10 14	2?		Sta. Clara I.	4 0	11	
Curanipe Rd.	10 35	4		Morio, Sandy Pt. of	5 0	11	
Maule R.	10 0	5		Puna I., Puna	6 0	11	
Llico	10 0	4–5½		Guayaquil	7 0	11	
Tuman B.	9 55	6	4	Sta. Elena B.	1 18	8	
Topocalma Rd.	9 55	6	4	Salango I.	0 47	12	
Matanza	9 50	5		Port Manta	3 4	6	
Toro Pt.	9 45			Caracas R.	3 30	10	
Port San Antonio	9 43	5		Cape Pasado	3 30	10	
Quintai Rd.	9 35	5		Atacames B.	3 37	13	
Valparaiso	9 32	5		Santiago R.	3 30	13	
Juan Fernandez I.	9 55	5¼		Tumaco Rd.	2 33	12	
P. Papudo	9 25?	5		Sanguianga, entr.	4 10	9	
Pichidanque B.	9 20	4					
Oscuro cove	9 0	6¼	4¼				
Port Tongoy	9 10	5					
Port Herradura	9 8	5					
Coquimbo B.	9 8	5					
Port Huasco	8 30	6	4				

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
Galapagos islands.				*Mexico, West coast.*			
	h. m.	ft.	ft.		h. m.	ft.	ft.
Charles I.	2 10	6		Salina Cruz B.	4 29	8¼	6¼
Albemarle I.	2 0	6		Port Sacrificios	3 15	6	
Chatham I.	2 23	6½		Maldonado	3 10?	8?	
Indefatigable I.	1 56	6		Acapulco	2 40	2¼	1
James I., W. end	3 10	5		Port Sihuatanejo	6 46	4	3
„ N. side	2 34	5		Chamela (Perula) B.	8 7	5¼	3¾
Wenman Is.	2 10			San Blas	9 41	6½	
				Mazatlan	9 40	7	
				Culiacan R., Altata	9 30	6	
New Granada and Veragua.				St. Lorenzo Chan.	8 22	4½	
				Guaymas Hr.	8 0	1	
Port Buenaventura, Negrilla Rf.	4 0	13		Tepoca B.	1 20	15½	11¼
„ off the town	6 0	13		Colorado R. entr.	2 15	25-30	16-20
San Juan R.	6 0	12		*Lower California.**			
Cabita B.	3 40	12					
Port Utria	4 0	12		Puerto Refugio	0 25	10¾	7½
Cupica B.	3 30	13		Sta. Teresa B.	11 50	10¼	7½
Octavia B.	3 30	13		San Lucas B.	8 28	4	
Pinas B.	3 15	14		La Paz Hr.	10 0	4½	
Chepo R.	3 40	16		Magdalena Hr.	8 25	5½	4¾
Pedro Gonzales, (Trapichi I.)	3 50	16		Ascuncion B.	9 2	5¾	
Chame B.	4 0	16		Port San Bartolomé	8 50?	7-9?	
Taboga	4 0	14		Cerros I.	9 10	7-9	
Panama Rd.	3 0	18¾	10½	Playa Maria B.	9 20?	7-9?	
Coiba I.	3 10	12?		Rosario B.	8 44	6½	
Bahia Honda	3 10	12?		Port San Quentin	9 19	4	
Port Nuevo	3 10	12		Colnett B.	8 45	6	
Parida I.	3 15	10		Santo Tomas	9 0	4	
El Rincon Hr.	2 51	6¼		Todos Santos B.	9 28	5	
Uvita B.	2 19	4¾		*United States.**			
				San Diego B.	9 35	5½	3¾
				„ Juan Anch.	9 40?	5	
Central America, West coast.				„ Pedro Hr.	9 36	5½	4
				Santa Catalina I.	9 15	5	4
Nicoya G., P. Herradura	3 9	10		„ Monica	9 37	5¾	4½
Port Culebra	3 15	5¾		„ Cruz I.	9 29	5	3½
P. Elena	2 30	5		„ Barbara Rd.	9 37	4¾	3½
Port San Juan del Sur	3 8?	10?		San Luis Obispo	10 17	5	3½
Corinto Hr.	3 6	11		Monterey	10 43	4¾	4
San Lorenzo	2 50	12	S	Farallones	10 40	4½	4
Port la Union	3 15	10¾	8?	San Francisco bar	11 39	4½	3¾
Jiquilisco B. entr.	2 38	7¼	4½	„ „ Hr.	0 5	5	4
Libertad	2 56	10?		Drakes B.	11 33	5¼	4¼
Acajutla B.	2 35	10	8	Bodega B.	11 19	4½	3¾
San José Rd.	2 55	9¼	6¾	Mendocino B.	10 35	4½	3¾
				Humboldt B. bar	11 33	5¼	4¼
				Trinidad, B.	11 27	5¾	4½
				Crescent city	11 33	5¾	4½

* The tides on these coasts are of so complicated a character that the following general explanation is considered necessary :—There are generally in each twenty-four hours, or rather in each lunar day of 24 h. 50 m., two high and two low waters, which are unequal in height and in time in proportion to the moon's declination, differing most from each other when the moon's declination is greatest, and least when the moon is on the equator. The high and low waters generally follow each other thus: starting from the lowest low water, the tide rises to the lower of the two high waters (sometimes improperly called "half tide"), then falls slightly to a low water (which is sometimes merely indicated by a long stand) ; then rises to the highest high water, whence it falls again to the lowest low water.—*Tide Tables for the Pacific coast of the United States.*

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Port Orford	11 32	6	4¾	Surge narrows	6 0	12	
Koos B.	11 55	6	4¾	Rendezvous Is.	7 0	14	
Yaquina R. entr.	11 50	7¼	5¾	Stuart I.	6 0	12–14	
Columbia R. entr.	0 10	7½	6	Waddington Hr.,)			
,, Marsh I. Cr.	1 20	4–7		Bute inlet)	6 0	13	
Astoria	0 19	7¾	6¼	Gowlland Hr., Dis-)			
Gray Hr.	0 12	7	5¾	covery passage)	5 30	11	
Necah B.	0 0	7¼	5½	Seymour narrows	4 0	12	
Angeles P.	1 51	5½	4½	Cameleon Hr.,)			
New Dungeness	3 3	5?		Nodales chan.)	3 0	16	11½
Port Discovery	2 30	7		Forward Hr.	3 0	16	11½
Port Townshend	3 49	5½	5	Beaver Cr., Lough-)			
Union City, Hood)				borough inlet)	3 0	16	11½
canal)	4 34	12?		Topaze Hr.	3 0	16	11½
Seattle, Puget Sd.	4 44	10	8½	Knox B.	noon.	16	12
Fort Steilacoom	4 46	11	9¼	Port Neville §	0 30	17	
Nisqually, Puget)				,, Harvey ‖ (Call)			
Sd.)	6 0	18	15	Cr.))	0 30	10	
Olympia	5 30	14		Beaver cove		15	
Drayton Hr.	2 0	12		Alert B., Cormor-)			
				ant I.)	0 30	15	
British Columbia.				Nimpkish R.	0 30	14	
				Su-quash Anch.	0 30	16	
Sooke inlet	2 0	8		Beaver Hr.‖	0 30	15?	11½
Race Is.	3 0?	8		Shushartie B.¶		12	
Esquimalt Hr.†	irr.	7–10	5–8	Bull Hr., Goletas)			
Victoria Hr.†	irr.	7–10	5–8	chan.¶)	0 30	12½	
Inner channels lead-)				Blunden and Tra-)			
ing from Juan)				cey harbours,)			
de Fuca Str. to)	irr.	10–12		Queen Charlotte)	noon.	16	11½
Haro Str.)				Sd.)			
Griffin B., Haro)				Cypress Hr., Sharp)			
Arch.)	irr.	12		passage)	noon.	16	11½
Roche Hr., Haro)				Deep Hr., Fife Sd.	noon.	16	11½
Str.)	irr.	12		Cullen Hr.	noon.	16	11¾
Fane I., Plumper Sd.	irr.	12		Sunday Hr. and)			
Fraser R. entr.)	6 30?	7–10?		Dusky cove,Queen)	1 0	13	
,, New)				Charlotte Sd.)			
Westminster.)		6		Farewell Hr. &)		15	8
Burrard inlet*	7 0	13	11	Sargeaunt pas-)	1 0	15½	12
Plumper cove,)				sage, Knight inlet)			
Howe Sd.†)	noon.	12		Quatsino Sd., Van-)			
Port Graves†	noon.	12		couver I.)	11 0	11	
Cowitchin Hr.		10–12		Klaskino inlet	noon.	12	
Maple B.		12		Klaskish inlet	noon.	12	
Stuart Chan.,Oyster)				Nasparte inlet,)			
Hr.)	6 0	10		Vancouver I.)	noon.	12	
Nanaimo Hr., G. of)				Ou-Ou-Kinsh inlet	noon.	12	
Georgia)	5 0	14		Kyuquot Sd.	noon.	12	
Nanoose Hr.	5 0	15		Esperanza inlet	noon.	12	
Pender Hr., Str. of)				Nuchatlitz inlet	noon.	12	
Georgia‡)	6 0	13		Nootka Sd.	noon.	12	
Union wharf, Bay-)				Hesquiat Hr.	noon.	12	
nes Sd.)	6 30	13		Clayoquot Sd.	noon.	12	
Port Augusta	5 0	12		Barclay Sd., Island)			
Hernando I.,)				Hr.)	noon.	12	
(Baker Passage))	6 0	12–14		Stamp Hr.	noon.	12	
Str. of Georgia)							

† May to October, from midnight to 3 a.m. November to April, from noon to 3 p.m.
* From September to March the day tides are the highest, the reverse occurs during the other month. The diurnal inequality is great, causing apparently but one tide in the 24 hours on many days. The tide has the peculiarity of rising to nearly the same level at the higher high waters, whether it be springs or neaps, whereas the level of low water varies in the usual manner. The streams sometimes turn as late as 2 hours after low water and 1½ hours after high water.

‡†¶ From observations made in October.   §‖ From observations made in May.

Place.	High water, full and change.	Rise. Springs.	Neaps.
America, North-west coast.			
	h. m.	ft.	ft.
Takush Hr., Smith Sd.	1 0	14	11
Fitz Hugh Sd., Schooner retreat	0 30	14	11
Safety cove	1 0	14	11
Gold Stream Hr.	1 0	15	12
Namu Hr.	1 0	15	12½
Welcome Hr.	noon.	15-16	12-13
Port John, Fisher Chan.	1 0	13	
M'Lauglin B. (Lama passage)	1 0	14	8-10
Kynumpt Hr.	0 30	14	11
Port Blakeney, Millbank Sd.	noon.	13	8
Finlayson Chan., Nowish cove	noon.	12	
Klemtoo passage, Finlason Chan.	noon.	13	8
Holmes B.	1 0	13	10
Coghlan Anch.	0 30	18	14
Lowe inlet	0 30	17	15
Klewnugget inlet, Grenville Chan.	0 30	17	
Edye passage, Refuge B.	1 30	17-22	14-17
Ogden Chan., Alpha B.	1 0	20	
Metlah Catlah, Chatham Sd.	noon.	21	17
Port Canaveral	0 30	18	
,, Stephens	0 30	18	
Qlawdzeet Anch.	1 30	17-22	14-17
Port Simpson	0 14	17¾	13
Nass B.	1 10	23	17½
Observatory inlet	1 5	23	12
Portland inlet (head)	1 30	23-27	15-20
Queen Charlotte islands.			
Skidegate inlet	1 0	17	14
Port Kuper	1 40	13	10½
Alaska.			
Convenient cove	0 34	13½	10½
Tongass narrows	0 24	19¼	14½
Tamgas Hr.	0 8	16¾	12¾
Kasaan B.	0 30	16½	12½
Etolin I. (Steamer B.)	0 20	16¾	12¾

Place.	High water, full and change.	Rise. Springs.	Neaps.
Alaska—cont.			
	h. m.	ft.	ft.
Zarembo I. (St. John Hr.)	0 35	14?	
Highfield		16	
Bucarelli G.		13	
Juneau Anch.	0 45	18½	14
P. M'Arthur	0 5	10?	8¼
Sitka *	0 6	10	7½
Gambier B., Frederick Sd.	0 43	16¼	12¼
Cleveland Passage, Frederick Sd.	0 29	16	12¼
Mole Hr., Seymour canal	0 54	16	12¼
Taku Hr., Stephens pass	0 27	17½	13¼
Wrangell Hr.	0 30	17½	13½
Funter B., Lynn canal	0 41	16½	12½
Portage cove, Lynn canal	0 29	18¾	14¼
Yakutat (Bering) B.	0 30	9	
Port Etches	1 15	9½	
Kadiak I.,St. Paul Hr.	11 47	12	
,, Lazy B.	2 28	8¼	
Kussiloff R. entr.		18-28	
Shumagin Is.	1 18	7½	
Aleutian islands.			
Iliuliuk, Unalashka	3 50	5†	
Adakh I.	noon.	5¼	
Attu I.	10 0?	6?	
Bering sea and strait.			
	h. m.		
St. Paul's I., Pribiloff Is.	5 49	3	
St. Matthew's I.	5 50?	3?	
Bering I.	4 to 5h.	6?	
Anadyr B.	4 0	9?	
St. Lawrence	8 15	1½?	
Good-news B.	6 15	13½	
Golovnin B.	6 23	3¾	
Port Clarence	4 25		
Arctic sea.			
Chamisso I.	4 42		
Point Barrow	11 30 to 1 30	¼-¾	
Herschel I.	1 25		2¼

* The tides are affected by diurnal inequality.
† Extreme range.

TIME

OF

HIGH WATER ON FULL AND CHANGE DAYS

AT THE PLACES GIVEN IN THE PRECEDING PAGES;

ARRANGED ALPHABETICALLY;

With the rise of tide at springs and neaps. *

When a query, thus ?, is placed after the time of high water and the rise, it indicates that what are given are approximations.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Abaco, Bahamas	8 0	3		Adonara, Flores, Malay Arch.		8	
Abbey Hd., Scotland	11 10	25	18½	Advent anch. Spitzbergen	0 45	6	
Abd-al Kuri, G. of Aden.	8 30	6		Adventure cove, Tierra del Fuego.	3 10	4	
Aberdeen, Scotland	1 0	12	10	Adventure P., New Zealand.	0 20	8	6
Aberdovey, England, W. C.	7 57	14¾	10	,, Sd., Falkland Is.	5 30	5½	
Abervrach, France	4 14	22	16	Agadir, or Santa Cruz, Africa.	0 45	9	
Aberystwith, England, W. C.	7 37	14½	10	Aguada B., Hindustan, W. C.	10 39	6¾	5¼
Abrolhos, Brazil	3 20	6–7		Agulhas, C., Africa, S. C.	2 50	5	
Abtao, P., Chile	1 18	16–18		Ahuriri, New Zealand	6 15	3–4	
Aburatani Hr., Japan	10 25	3¾	2	Aillik B., Labrador.		7	
Aburatsu ,,	6 3	5¼	4½	Ailuk, Kapenuir I., Marshall Is.	4 53	8	
Abu shahr, Persian G.	7 30	6–8	4–6	Air Pt., R. Dee, England	10 54	25	19
Acajutla B., Central America, W. C.	2 35	10	8	Aix, ile d', Charente R., France.	3 35	16¾	13
Acapulco, Mexico, W. C.	2 40	2¼	1	Ajad. Hindustan, W. C.	0 50	14	11
Acheh Hd., Sumatra	10 0	5	3¼	Ajiro, Nipon, S. C.	5 15	6½	4½
Achillbeg, Ireland	5 14	10¾	8	Akabah		4	
Acul Hr., St. Domingo	6 0 ?	3 ?		Akaroa Hr., New Zealand	3 24	8	6
Adakh I., Aleutian Is.	noon.	5¼		Akishi, B., Japan	4 30	5	
Adam B., Australia, N. C.	6 0	18		Akyab, Arakan R., B. of Bengal.	9 37	7¾	5¼
Adams, P., (Mary I.) Yellow sea.	2 0	10		Al Basra, bar, Persian G. §	11 30	10	8
Addu atoll, Maldives	1 0	4		,, town	6 0?	9?	
Adelaide, P., Australia, S. C.+	5 25	8	4½	Al-Bidaa, Persian G.	8 30?	6?	
,, Semaphore jetty	4 10	7½	4	Alabat I. Luzon	10 0	9	
Adelaide R., Australia, N. C.	5 30	17	12½	Albany I., Australia, N. C.?	11 0	10	8½
Aden, Arabia, S. C.‡	7 54	7	4½	Albemarle I., Galapagos	2 0	6	
Adolphus I., Torres Str. .	0 30	10					

* By the rise of the tide is meant its vertical rise above the mean low water level of spring tides.
† *See* note, page 202.   ‡ *See* note, page 189.   § *See* note, page 189.   ‖ *See* note, page 200.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Albemarle, P., Falkland Is.	7 15	7		Anguille C., Newfoundland.	9 0	4½	3
Albert R., Kangaroo Pt., Australia, N. C.	8 0	10-13	3-8	Anna Maria B., Marquesas Is.	3 50	4½	
Alcmène, P., isle of Pines, New Caledonia.	8 6	4		Anna Pink B., Patagonia, W. C.	0 45	5	
Aldabra I., Mozambique .	4 0?	8	5	Annan Foot, Scotland .	0 5	28½	20
Aldborough, England .	10 45	8 '	6½?	Annapolis, U.S. .	4 38	1	1
Alderney, Channel Is.	6 46	17½	12½?	Annesley B., Red S. .	1 0	3-5	
Aleppi, Hindustan, W. C.	2 0	3	1-2	Annisquam, U.S. .	11 0	10?	9
Alert B., Cormorant I., Johnstone Str., Vancouver I.		15		Anno Bom I., Africa	3 45	5	
,, Hr., Trinidad Chan.	0 15	7		Anpei Rd., Formosa	9 40	3?	2½
Alexander P., Africa, W. C.	3 0	5		Antechamber B., Australia, S. C.	2 15	4-5	
Alfred P., Kowie R., Africa., S. C.	3 50	4-5	3	Anticosti I., G. of St. Lawrence, Heath Pt. .	11 20	4½	2½
,, Australia, S. C.	4 37	8	5-6	,, Bear B. . .	1 10	5	3
Algeçiras, Spain . .	1 49	4	2½	,, West Pt. .	2 0	6	4
Algoa B., Africa, S. C. .	3 10	6		Antigonish Hr., Nova Scotia.	9 0	4	2
Alguada light-house, B. of Bengal.	9 13			Antigua I., English Hr., Caribbean S.		2	
Alligator B., Flores		6		Antipodes Is. .	3 30	6?	
,, R., Australia, N. C.	8 15	15		Autongil B., P. Choiseul, Madagascar.	4 0	5	
Alloa, firth of Forth, Scotland.	3 18	17½	15	Antrobus I., G. of St. Lawrence.	10 30	5	3
Almeida B., Africa, E. C.	4 10?	12-15		Antwerp, Belgium .	4 25	15	
Altata, Mexico, W. C.	9 30	6		Aomori, Japan .	4 0	2½	
Amami o Sima Str., Liu Kiu Is.	6 34	6½	4½	Aotea Hr., New Zealand	10 0	12? 2½-4	9½
Ambavarane, Madagascar	4 15	5?		Apalachicola B., G. of Mexico.			
Amboina, Moluccas	0 30	8½	3½	Apamama, Gilbert Is. .	4 30	6	
Ameland, Netherlands .	9 30	5?		Apia Hr., Samoa .	6 30	4½	
Amet Sd., Nova Scotia .	10 0	8	5	Appeetetat B., G. of St. Lawrence.	11 10	5?	3?
Amherst, G. of Martaban	2 21	20-22	12	Appin, P., L. Linnhe, Scotland.	5 26	12½	8½
Amirante Is., Indian O..	5 0	8?		Appledore, England .	5 58	23	16½
Amlwch, England, W. C.	10 15	20	15½	Aquin B., St. Domingo .	irr.	2-3?	
Amoy, Inner Hr., China, E. C.	noon.	18½	14½	Aracati, Brazil	6 0	8	
,, Chang Chiu, West R.	3 40			Araish El, Africa, N. C. .	1 30	9-12	
Ampamonti B., Madagascar, N. W. C.	4 23	10½		Arari B., Japan .	6 0	6½	4
Ampasilava B., Madagascar.	5 0	14½	9?	Arasaig, Scotland .	5 50	13½	10
Ampenam B., Lombok .	8 0	6		Arauco B., Chile .	10 0	5	
Annum, Denmark .	0 30	9		Arbroath, Scotland	1 45	14	11
Amsterdam I., Indian O.	11 0	3		Arcachon, France .	4 37	11½	9½
Amúr Str., G. of Tartary	11 40	5-6		Areas cays, G. of Mexico .	noon.	1½	
Anadyr B., America	4 0	9?		Ardglass, Ireland .	11 0	16	12
Ancud P.. Chile	0 14	6		Ardintallan, L. Feochan, Scotland	5 31	9	6½
Andaman Str., Indian O.	10 24	9½		Ardrishaig, L. Fyne .	11 53	9	7½
Andrava B., Madagascar	3 30	7		Ardrossan, Scotland	11 49	10	7½
Anegada, Virgin Is.	9 0	1½		Arenas, cay, G. of Mexico	noon.	1½-2	
Aneityum, P. Inyang, S. Pacific.	6 35	4		Argyle, B. of Fundy .	9 27	12?	10½
Angeles P., U.S.	1 51	5½	4½	Arhno atoll, Marshall Is.	4 45	6?	
Angoche R , Africa, E. C.	4 0	10-12		Arica Rd., Chile .	8 0	3½	
Angosto, P., Magellan Str.	0 40	4		Arichat, Madame I. .	8 10	5	4
Angra, Terceira, Azores .	0 32	4½		Arinagour, Coll I., Scotland, W. C.	5 41	12½	9½
,, Pequena, Africa .	2 30	8		Arkhangel, White S. .	7 28	2½	
Angria Bk., Hindustan .	10 30	9		Arklow, Ireland .	8 0	4	2?
Anguila Is., Bahamas	8 45	3½		,, Bk., Ireland .	8 0	3½	3

Place.	High water, full and change.	Rise.		Place.	High water, full and change.	Rise.	
		Springs.	Neaps.			Springs.	Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Armstrong Chan., Banks Str.	10 36	5–7		Badas I., Linga I., Sumatra.†	6 0	12	
Arnhem B., Australia. N. C.	8 10	6		Badong B., Baly, S. C. .	11 0 ?	9½	
				Bagru R., Africa, W. C. .		11	
Aroa, Malacca Str. .		14	9	Balna, Brazil .	4 26	8	
Arosa B., Spain	3 0	11	7½	,, de Cadiz cay, Cuba	9 20	3	
Arsuk, Greenland, W. C.	6 25	12	9	,, Honda, Central America.	3 10	12 ?	
Arthur, P., Tasmania	7 52	4					
,, Yellow S.	10 45	9 ?		Bahrain, Persian G.	6 10	5¾	4¾
Aru B., Sumatra Str.	noon.	8		Baitiquieri, P., Cuba	9 7	2¼	
Aru Pt., Java S.		7		Bajoa Rd., Celebes .	0 0	9	5–6
Arundel, England .	0 25	10	7	Bakit B., Palawan .	10 0	6	
Ascension I., S. Atlantic	5 30	2		Balabalagan, Makassar Str.	6 0 ?	8 ?	5 ?
Ascuncion B., California	9 2	5¾					
Ashe inlet, Hudson Str. .	8 32	30	22	Balad Hr., New Caledonia.	6 15	4½	
Ashrafi Is., Red S. .	6 0	1¾					
Aspra Spitia B.		2⅛	1⅛	Balambangan I., Borneo, N. C.	10 0	6–8 ?	
Assizes Hr., Labrador	7 5	4⅛	3⅛				
Astoria, Oregon	6 19	7¾	6¼	Balasor R. entr., B. of Bengal.	10 0 ?	11–13	8
Astrolabe Rd., N. Zealand	9 10	14	10				
Atacames B., Ecuador	3 37	13		Balbriggan, Ireland	10 40	13	
Atchafalaya B., G. of Mexico.	irr.	2½	1½	Bali Str. .	0 30 ?	9	
				Ballachulish, L. Leven, Scotland.	5 43	11	
Athline, L. Seaforth	6 16	15	10				
Athelet .	3 0 ?	6 ?		Ballinacourty, Dungarvan, Ireland.	5 12	12½	9½
Atico Rd., Peru	8 53	5					
Attu I., Aleutian Is.	10 0 ?	6 ?		Ballinskellig B., Ireland	3 40	12	7¼
Auckland Hr., New Zealand.	7 32	11	9	Ballycastle B., Ireland .	6 25	3	2
				Ballycottin, Ireland	4 54	12	9½
,, I., S. Pacific, P. Ross	noon.	3		Ballycrovane, Kenmare R.	3 42	10½	7¾
				Ballynakill B., Ireland .	4 40	12½	9¼
Augusta, P., Australia .	8 30	12		Ballyness bar, Ireland	5 22	11½	8½
Augusta, P., Sicily .	3 20 ?	¾–1¼		Ballysadare quay ,,	6 0	8¾	5¾
Augusta, P., Str. of Georgia	5 0	12		Ballyshannon bar ,,	5 18	11½	8½
				Balta, Scotland	9 45	6½	4¾
Auki I. Hr., Malaita	9 0 ?	5		Baltimore, Ireland .	4 23	10½	8¼
Aulezavik Sd., Labrador.		5		,, U.S.	6 33	1½	1¼
Aux Cayes B., St. Domingo	irr.	2–3 ?		Baltrum, Germany .	11 20	8	
Avatcha B., Kamchatka*	3 30	6⅛	4¼	Banana Is., Africa, W. C.	7 18	10	
Aviles R., Spain, N. C. .	3 0	12		Bandar Aluleh, G. of Aden.	6 45	6	
Avon isles, Australia, E. C.	8 30	5					
Avon R., Bigbury B., England, S. C.	5 47	16½	11½	,, Jissah, Persian G.	9 0	5	
				,, Khairan ,,	9 0	5	
Awa Sima (Inland S.), Japan.	0 7	10½	8¼	Banif, Scotland	0 28	10½	
				Bang-pak-kong R.. Siam	7 0	9½	
Awanui R., New Zealand	7 44	7		Bangkok R. bar,‡ Siam .	7 40	11	9
Axim, Africa, W. C.	4 30	4		Banjuwangi, Java .	0 30 ?	9	
Aylen, B., Yellow S.	2 30	6	4	Banka Str., Celebes	6 45	7	5½
Ayr, Scotland .	11 50	8¾	7¼	Bankot R., entrance, Hindustan, W. C.	10 37	9½	7¼
Ayre, Pt., I. of Man	11 7	20 ?	16 ?				
				Banoko, Africa, W. C. .	5 24	5	
				Bantam, Java .		5	
				Bantry Hr., Ireland	3 47	10	7½
				Baracoa, Cuba	7 23	2	
				Barataria B., G. of Mexico	irr.	1½	
				Barbados, Caribbee Is. .	3 0	3	1½
Bab-el-Mandeb, Str. of, G. of Aden.	8 0	5 *	3	Barbara, P., Patagonia, W. C.	0 28	6	4
Babel Is., Bass Str.	10 5	7		Barclay Sd., Island Hr., Vancouver I.	noon.	12	
Babi I., Timor	1 30	8					

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Barclay Sd. Stamp Hr.	noon.	12	
Bardsey I., England, W.C.	7 40	15	
Barfleur, France	8 59	18	13½
Barmouth, England, W.C.	7 46	14½	10½
Barnstable, U.S.	11 22	10	8½
Barnstaple bridge, England.	6 28	10½	
Barquera, entr. Spain,	3 15	10¾	
Farra I., North Hr., Scotland, W. C.	5 48	11½	8½
,, Castle B., Scotland, W. C.	5 44	11¾	8½
,, Hd., Bernera I.	5 45	11¼	7
Barracouta Hr., G. of Tartary.	10 0	3-4	
Barragan B., S. America, E. C.	7 0	5-9	
Barren I., Palawan.	9 30	5¾	
,, Is., Madagascar	4 45	12	
Barrow Hr., Newfoundland	6 13	4½	2½
,, Pt., Arctic regions	11 30 to 1 30	¼-¾	
Barry I., England, W. C.	6 38	37½	28½
Barton, P., Bubon Pt., Palawan	10 55	6	
Bas, île de, France	4 52	23	17
Basiduh, Persian G.	noon.	10	
Basil B., Korea, W.C.	4 15	18	
Basque, P., Newfoundland.	8 55	5½	3½
Bassein, Hindustan, W.C.	11 49	11½-15½	8½-11
Bassein R., B. of Bengal.	9 47	7½	5¾
Batanes, Bashee Is., China S.		4	
Batavia, Java*	10 0	2?	
Bateman B., Australia, E. C.	8 0	4-6	
Bath, Netherlands	3 15	14	
Bathurst, G. of St. Lawrence.	3 15	7	4
Batiscan, R. St. Lawrence	9 48	3½	2
Batticalao Rd., Ceylon	5 0	2-3	
Batu Bara R., Sumatra, Str.	3 0	7-10	
Baudin I., Australia, N.W. C.	11 31	19-22	12-15
Bawean I., Java S.*	8 to 10	5¾	
Bay of Harbours, Bull Rd., Falkland Is.	6 0	5	
Bay of Islands, Motumea islet, New Zealand	7 15	9	6
Bay of Mercy, Banks land.		2	
Bazaruto, C., Africa, E. C.	4 26	12	
Beachy Hd., England	11 20	20	15
Beadon, Australia, W. C.	4 30	7-8	
Beagh quay, Ireland	5 49	18	13
Beagle Bk., Australia, N.W. C.	10 0	12	
Beagle B., Australia, W.C.	noon.	17½	12¾
Bear, C., Prince Edward I.	9 0	6	3
,, Hd., Cape Breton I.	8 30	4½	3
Beatrice islet, Australia, N. C.		8	
Beaubère I., G. of St. Lawrence.	6 30	6	4
Beaufort Hr., U.S.	7 21	3	2½
Beaulieu England, S. C.	10 25 / 0 15	10	8½
Beaumaris ,, W. C.	10 30	23½ 15	16½
Beaver cove, Vancouver I.			
,, Cr., Loughborough inlet, British Columbia.	3 0	16	11½
Beaver Hr., Vancouver I.	0 30	15¾	11½
Beaver Hr., Nova Scotia.	7 40	6½	4½
Bedeque Hr., Prince Edward I.	10 15	7	5
Bedford B., Tierra del Fuego.	0 30	7½	
Beechey I., Barrow Str.	0 30	5	
Beit Hr., G. of Cutch	0 12	11½	9½
Belan Pt., England, W. C.	9 14	13¼	10¼
Belfast, Ireland	10 43	9½	8
,, U.S.	11 5	10½	8¾
Belgrano, P., La Plata	6 0	16	13
Belize, Honduras		1½?	
Bell (Bel) Sd., Spitzbergen	1 6	7	
Belles Amour Hr., Labrador.	9 0	4½	2½
Belligam B., Ceylon	2 20	2¼	
Bellona Rfs., Middle, Australia, E. C.	8 30	6	
Belloram Hr., Newfoundland.	8 59	6	
Bembridge Pt., England.	11 0	14	10½
Benbecula, Scotland	6 3	11½	8½
Benevente, Brazil	3 0	5	
Benguela, Africa, W. C.	3 01	4½	3½
Benin R., Africa, W. C.	4 30	7	
Benkulen, Sumatra	6 0	3-5	4½
Benten Sima, Japan	11 20	6	
Beppu B., Japan	7 17	7¾	
Berbereh, G. of Aden	9 30	8½	6
Berbice, Guiana	4 30	8-10	6
Bergen, Norway	10 25	4	
Bering I., Bering S.	4 to 5h.	6?	
Berkeley Sd., Falkland Is.	5 0	7	
Bermeo, Spain, N. C.	3 0	10¾	
Bermuda, Ireland I., N. Atlantic.	7 14	3¾	2½
Bernera, L. Roag, Lewis I.	6 11	11	8
Berneray I., Sd. of Harris	6 11	13	9½
Bersiap Pt., Banka Str.	6 30	12	
Bersimis R., R. St. Lawrence.	2 0	12	7

* *See* note, page 192.

Place.	High water, full and change.	Rise Springs.	Rise Neaps.	Place.	High water, full and change.	Rise Springs.	Rise Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Berthier pier, R. St. Lawrence.	5 40	17½	14	Block I., U.S. .	7 36	3½	2½
Beru fiord, Iceland .	3 10	7		Bluff, Hr., New Zealand .	1 18	8	6
Berwick, Scotland .	2 18	15	11½	,, cay, Bahamas	7 45	4½	
Betchewun Hr., G. of St. Lawrence.	11 32	5	3	Blunden Hr., British Columbia.	noon.	16	11½
Betsy cove, Kerguelen I.	0 35	3		Blyth, England, E. C.	3 15	15	11
Beypur, Hindustan, W.C.	11 16	5	4	,, R., Southwold, England.	10 20	6½	4½
Bhaunagar, Hindustan, W. C.	4 27	32	24½	Boca Grande, Trinidad .	3 30	4	2½
Bias B., Tooniang I., China, E. C.	8 0			,, ,, U.S. .	1 9	1¼	⅞
Bias B., Tsangchow I., China, E. C.	8 30			,, Mono, Trinidad .	3 50	4	2½
Bic. I., R. St. Lawrence.	2 15	14	8½	Boddam cove, Ladrone Is.	9 40	4½	
Bidda R., B. of Bengal .	10 0	14		Bodega B., California .	11 19	4½	3⅞
Bideford, England, W. C.	6 7	16		Bodkin Pt., U.S. .	5 42	1¼	1
Bijouga Is., Arkas Chan., Africa, W. C.	10 10	11-14	9	Bojador C., Africa, W. C.	noon.	8?	
,, Bissao, Africa, W. C.	11 0	8		Bolt Hd., England, S. C.	5 45	15?	11?
,, Orango, Africa, W. C.	10 0	11		Bombay, Apollo Bandar, Hindustan, W. C.†	11 35	14½	11½
Bilbao, bar, Spain .	3 0	13		Bombotoke, Madagascar, W. C.	4 45	12½	
,, town, Spain .	3 20	9		Bonacca I., B. of Honduras.	9 0	1½	
Biloxi, G. of Mexico .	irr.	2		Bonar bridge, Dornoch firth.	0 34	6½	
Bima B., Sumbawa	noon.	6		Bonanza, Spain .	2 0	12½	8
Bimbia R., Africa, W. C.	5 8	6		Bonavista, Newfoundland.	7 25	3¼	2¼
Binnie, France .	6 3	30	22½	Bongao, Sulu S. .	6 40	6	
Bintula R., Borneo .	5 45	6		Bonham I. China, E. C.	10 38	13	10-11
Bira Bira B., New Guinea	9 0	5½	3½	Bonham Is., Anch., N. Pacific.	3 30	6	
Bird I., Kalandagan Is., China S.	9 30	6		Boni Hr., New Guinea .	5 0	6	
,, Is., Africa, S. C.	4 0	4-5		Bonne B., Newfoundland .	10 40	6	4½
,, I., Lt. Ho., U.S. .	7 59	5¼	4½	Bonny R., Africa, W. C.	4 50	6	4
Blaavand Pt., Jutland .	1 44	7	5	Bonthain Rd., Celebes .	9 0	8	
Black Ball Hr., Ireland .	3 40	9¼	7¼	Booby I., Australia, N. C.	4 30	8	
,, Rk., B. of Fundy .	11 29	36	31	Bordeaux, France .	6 50	15½	12
,, Pt., Australia, S.C.	4 37	8	5-6	Boria B., Hindustan, W. C.	10 0	10	8
Blakistone I., U.S. .	1 37	2-3		Borja B., Magellan Str. .	1 15	5	
Blacksod B. (quay), Ireland.	4 47	10	8½	Borkum, West, Germany	10 30	7	
Blacktoft, R. Humber .	6 59	16		,, East, Germany	10 30	7	
Blair Hr., Malay Pen. .	8 50	9		Boscastle, England, W.C.	5 15	22	17
,, P., Andaman Is. .	9 36	6	5	Boston dock, England, E. C.	6 30	21	11½
Blakeney, England, E. C.		9		,, deep (Clay hole), England, E. C.	6 0	22	15½
,, (bar), England, E. C.	6 30	15		,, Charlestown, U.S.	11 27	11	10
,, P., America, N.W. C.	noon.	13	8	,, Lt. Ho., U.S. .	11 9	11	9½
Blanche B., New Britain*	9 0	2¾	1½	Botany B., Australia, E. C.	8 10	7-8	
,, P., Streaky B., Australia, S. C.	0 5	6		Boucaut, France .	3 53	8½	5½
Blankenberghe, Belgium	0 15	13	10	Boughton Hr., Prince Edward I.	8 40	5	2⅞
Blanco, C., Africa, W. C.	11 46	6		Boulogne, France .	11 28	25¼	19⅞
,, Encalada Rd., Chile.	1 50	3½		Bourbon I., see Reunion I.			
Blasket Is., Ireland .	3 30	11½	8	Bow I., S. Pacific .	2 40	3	
Blauort sand, Germany .	0 38	12					
Blewfield, Mosquito C. .	1 50	2					
Bligh Sd., New Zealand .	10 45	8	6				
Blind B., Nova Scotia .	7 46	7½	6				

Place.	High water, full and change.	Springs.	Neaps.
	h. m.	ft.	ft.
Bowling, R. Clyde, Scotland.	0 30	9¾	
Boyanna B., Madagascar, W. C.	4 33	10¾	7¼
Bradore B., Labrador	10 35	4¾	2¾
Bramble cay, Torres Str.	9 15	12	
Brandy Pots, R. St. Lawrence.	3 0	17	10
Brass R., Africa, W. C.	4 30	6	4
Brawa, Africa, E. C.	4 10	8	
Bray Hd., Ireland	10 45	12	9½
Brazos Santiago, G. of Mexico.	irr.	½–1¼	
Breaker Pt., China, E. C.	10 0?	8	
Breaksea Sd., New Zealand.	11 15	8	4
Brébat, France	5 51	31	23½
Bremerhaven, Germany	1 4	10¾	
Brest, France	3 47	19½	14½
Bridgeport, U.S.	11 11	8	6¼
Bridgewater, England	8 0	18	
,, bar, England.	6 50	35	26½
Bridlington, England	4 39	16	12
Bridport, England	6 5	11¼	7¾
Brielle, Netherlands	3 0	5	
Brighton, England	11 15	19¾	16
Brisbane, Australia	11 0	6½	
,, the Quarry	10 30	6¾	
,, bar	10 5	7	5½
Bristol (King Rd.), England.	7 13	40	31
,, Cumberland dock gates.	7 13	31½	
Broad Sd.,* Long I., Australia, E. C.	11 35	22–26	15–19
,, St. Lawrence ck.	11 55	18–23	13–17½
,, Roundish I.	11 50	23–28	15½–20
Broadhaven Hr., Ireland	5 0	10½	7½
Broadway R. entr., China, E. C.	11 0	7½	
Broken B., Australia, E. C.	8 30	5–7	
Brothers Is., Red S.	6 0	2	
Broughty ferry, Scotland.	2 22	14½	11
Brouwershaven, Netherlands.	2 0	10	8
,, gat, Netherlands	1 0	9¼	7½
Bruinisse, Netherlands	2 30	11	
Bruit R., Borneo	3 0	11	
Brunet Is., Newfoundland.	9 3	6¼	4¼
Bruni R., Borneo	11 0	7¼	5¼
Brunsbuttel, Germany	1 53	9¾	
Bucarelli G., America, N.W. C.		13	
Buchupureo Rd., Chile	10 14	2?	
Buctouche R., G. of St. Lawrence.	7 0?	4?	2?
Budehaven, England	5 45	23	17
Buenaventura, P., Central America (Negrilla Rf.).	4 0	13	
,, off the town	6 0	13	
Buenos Aires, S. America, E. C.†	6 0	3–5	
Buffalo R. (East London), Africa, S. C.	3 47	5	3¾
Buffett Hr., Newfoundland.	8 12	7	5
Buka B., Rotti I.	noon.	6	
Bulama I., Areas Chan., Africa, W. C.	10 10	11–14	9
Bull Hr., Goletas Chan., Vancouver I.	0 30	12½	
Bull I., Newfoundland	7 22	3½	2
Bulls Island B., U.S.	7 16	5¾	4½
,, mouth, Achill Sd., N. entr., Ireland.	5 38	10¾	7½
Bulsar Khari, Hindustán, W. C.	1 45	18	14½
Buluagan O'sta Ana, P., Philippine Is.	noon.	5½	
Bunawe, L. Etive, Scotland.	7 54	5¾	
Bunessan, Scotland	5 24	12	8¼
Burai, B., New Caledonia	8 39	2½	
Burgeo Is., Newfoundland.	8 32	6¼	4
Burin Hr., Newfoundland.	8 45	6½	4½
Burnett R., Queensland	9 30	8–9	3–4
Burntisland, firth of Forth, Scotland.	2 24	16½	12¾
Burnt isles, Kyles of Bute.	11 50	10	8
,, Is., Newfoundland	7 48	7	
Burong I., China S.	4 45	7	
Burrard inlet, G. of Georgia, British Columbia.‡	7 0	13	11
Burry, P., England, W.C.	6 3	26¼	19¼
Buru I., Moluccas	1 32	4½	
Burwell, P., Hudson Str.	9 25	19	14¼
Busainga, Burias I.	0 30	6	
Busselton, Australia, W. C.	9 29?	2¼	
Busuanga, China S.	0 30	6	
Busum, Germany	1 21	12	
Butang group, Malacca Str.	10 34	9	
Buton Str., Celebes	5–6	7½	
Cabita B., New Granada	3 40	12	
Cacheo R., Africa, W. C.	7 45	8	

* *See* note, page 200.   † *See* note, page 180.   ‡ *See* note, page 208.

Q

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Cachipour, C., Brazil	5 52	7-10		Canton, R., entr., China.	10 0	8	
Cadiz, Spain	1 56	12	9	,, (Kuper I.) in March	2 40	5½	
Caen, France	10 57			,, ,, May	1 40	5½	
Caimites, St. Domingo	8 0?	1?		,, ,, & June			
Cairnlough, Ireland	10 51	5½	5	,, ,, Sept.	2 12		
Cairns Hr., Australia, E. C.	9 30?	8-10	5-7	,, ,, Oct.			
Calabar R., Africa, W. C.	4 50	6	4	Cape Byron B., Australia, E. C.	8 45	5	
,, Old, Africa, W. C.	6 30?	10?	6?	,, Coast castle, Africa, W. C.	4 30	6	
Calais, France	11 49	21	17½	,, Gracias Hr., B. of Honduras.	10 30	2	
Calbuco, Chile	1 22	15-20		,, May landing, U.S.	8 19	6	5
Calcasieu R., G. of Mexico.		2½	1½	,, Rouge Hr., Newfoundland.	7 0	6	4
Calcutta, Bengal*	2 2	17	12	Cappename R., Guiana	5 30	8	
Caldy Rd., Bristol Chan.	5 37	25½	19½	Caracas R., Ecuador	3 30	10	
Caledonia Hr., New Granada.	11 40	1½	1	Caraquette Hr., G. of St. Lawrence.	2 40	6	3
Calf Sd., isle of Man	11 17	16½	13	Carbonear, Newfoundland	7 20	4½	3
Calicut Rd., Hindustán, W. C.	10 59	5	4	Cardiff, Bute dock, England, W. C.	7 0	36½	27
Callao B., Peru	5 47	4		Cardigan, England, W.C.	7 1	12	9
Calshot (Castle Pt.), England.	11 30	14½	11½	,, B., Prince Edward I.	8 40	5	3¼
Calstock, R. Tamar, England.	6 6	12½	8½	Careening B., Australia, N.W. C.	11 45	30	
Calvados chain, Louisiade Arch.	9 0	5	3½	Carelmapu, Patagonia, W. C.	0 50	10	
Camamu P., S. America, E. C.	4 0	6½		Carenage, Trinidad	4 20	4	2½
Camariñas, P., Sp.	3 0	15		Carenero Hr., Venezuela	10 0?	2?	
Cambay town, Hindu-stán, W. C.	5 10	day 23 night 30		Cargados Carajos shoals, Indian O.	2 0	4	
				Cargreen, R. Tamar, England.	5 47	14¾	10¾
Camden Sd., Australia, N. W. C.	11 30	30		Caribou Hr., Nova Scotia	10 0	6	4
Camden Hr., U.S.	11 8	10½	9¼	Carleton Pt., G. of St. Lawrence.	3 0	6	4
Cameleon Hr., Nodales Chan., British Columbia	3 0	16	11½	Carlingford bar or Cranfield Pt., Ireland	11 0	16	11
Cameroon C., Africa, W. C.	5 30	6½	.	Carlisle, P., England	0 10	20	14
Campbell C., New Zealand.	6 0	8	6	Carmarthen bar, England	5 44	26	19½
,, I., S. Pacific	noon.	3½		Carmarthen town	6 10	8½	
,, town, G. of St. Lawrence.	4 0	10	7	Carnarvon, England	9 30	15¾	12
Campbelton, Scotland	11 45	8¾	6	Carnot B., Australia	11 0	18	
Campeche, Yucatan	1 45	2½	2	Carnsore, Ireland	6 0	9	
Campobello, Welchpool, B. of Fundy.	11 21	23½	20	Caroline Is., S. Pacific	4 0	1½	
Canada B., Newfoundland.	6 46	5¼	1½	Carouge R., R. St. Lawrence.	7 15	16	11
Canaveral, C., U.S.	7 0?	4-6		Carrigaholt, Ireland	4 44	14	10½
,, P., America, N.W. C.	0 30	18		Carrisal Bajo B., Chile	8 30	5	
Cancale, France	6 20	37	27	Carsaig, Scotland	5 28	10	7¼
Canna I., Scotland, W. C.	6 19	14	9½	Cartagena, New Granada	11 0	1½	1
Canso gut, N. entr.	9 15	4	2	Carteret, France	6 25	31	22½
,, P. Hastings, Nova Scotia.	9 10	4½	3	,, Pt., New Ireland	irr.	6?	
,, Hr., Nova Scotia	7 48	6½	4½	Carver Hr., U.S.	11 0	10	9
				Cascaes B., Portugal	1 51	10½	
				Cascumpeque Hr., Prince Edward I.	5 40	3	2
				Cashla B., Ireland	4 33	16	12
				Casquets, English Chan.	6 45	15½	

* *See note, page 191.*

Place.	High water, full and change.	Rise. Springs.	Neaps.	Place.	High water, full and change.	Rise. Springs.	Neaps.
	h. m.	ft.	ft.	Chang-zu-do I., Yellow S.	9 30	12	8
Castillo B., Rio de la Plata.†	8 30	2		Chapu Rd., Hang-chu B., China, E. C.	noon.	25	
Castlemaine, Ireland	4 30	14¼	9½	Charles, C., U.S.	7 51	3¼	
Castletown, Ireland	4 14	9¾	7½	,, I., Galapagos	2 10	6	
,, isle of Man	11 10	20	16	,, I., Labrador	7 30	6–7	
Castletownsend, Ireland	4 21	10¾	8	,, Sd., New Zealand	11 15	8	4
Castors Hr., Newfoundland.	10 50	5 ?		Charleston, U.S.	7 24	5¼	4½
Castries B., G. of Tartary	10 30	5¼–8½		Charybdis Hr., Miautau group, Yellow S.	10 30	9	
Castro, Patagonia, W. C.	0 11	18		Chateau B., Labrador	7 16	4	2½
Castro Urdiales, Spain, N. C.	3 0	12		Chatham, England	0 43	18¼	14½
Casuarina Pt., Palawan	9 30	.6¾		,, I., Galapagos	2 23	6½	
Catalina Hr., Newfoundland.	7 0	6	4	,, Is., P. Hutt, S. Pacific.	5 0	4–5	
Catherine Pt., Magellan Str.	8 5	30		Chatte, C., R. St. Lawrence.	noon.	13	8
,, Sd., U.S.	8 37	8	6½	Chauan B., China, E. C.	11 0	6½	
Catlin R., New Zealand	2 30	8	4	Chauquis Is., Chiloe	0 35		
Cato I., Australia, E. C.	8 0	6		Chaul, Hindustan, W. C.	11 0	11¼	8
Catoche, C., Yucatan	9 30	1½		Chausey, isles de, France	6 14	35	26
Cattawade bridge, Stour R., England.	1 8	4¼		Chaussé de Sein, France	3 21	17½	12
Cavalli Is., New Zealand	8 0	7		Chebouge, B. of Fundy	10 4	15	11¾
Cavern I., Palawan	9 30	5½		Chedúba, B. of Bengal	9 15	10	7
Cawee Is., G. of St. Lawrence.	1 50	9	5	Chentabun R., G. of Siam.	10 0	5½	
Cay Francés, Cuba	6 0	2½ ?		Chepo R., New Granada	3 40	16	
Cayenne, Guiana	4 37	5–7		Chepstow, England	7 30	38	28½
Cayeux, France	11 14	28½	22	Cherbaniani Rf., Laccadives.	10 0	7	4
Cayo Moa, P., Cuba	8 9	2½		Cherbourg, France	8 0	17¾	13
Ceara, Brazil	5 35	8¼		Chesilton, England	6 13	10¼	7
Cedar cays, U.S.	0 51	3¼	2¼	Chester, Crane wharf, England.	0 16	10	
Cedeira, Spain, N. C.	3 0	15		Chester R., Rockhall Cr., U.S.	5 23	2¼	1
Centre I., Foveaux Str., New Zealand.	0 15	8	6	Cheticau, C. Breton I.	8 15	3½	2
Ceram, Wahaay Hr., Moluccas.	6 0	3–4		Chetlat I., Laccadives	10 30	7	4
Cerro Azul B., Peru	5 0	3		Chichester, England	11 30	14	11
Cerros I., California	9 10	7–9		Chifu, Yellow S.	10 34	8	6½
Ceuta, Africa, N. C.	2 6	3¾	2½	Chi Ho, G. of Pecheli	4 0	10½	8
Chacabuco P., Chonos Archo.	1 15	7		Chilachap Hr., Java	9 25	6	4 ?
Chacao B., Patagonia, W. C.	0 40	14		Chilca, P., Peru	5 30 ½	4	1
Chacao narrows, Patagonia, W. C.	0 50	16		Chilka lake, B. of Bengal	9 0	4½	3
Chahbar B., Beluchistan	9 30	9		Chiluán I., Africa, E. C.	4 49	18½	13
Chalky inlet, New Zealand.	11 5	8	4	Chimney I., Rees pass, China, E. C.	11 30	12	
Chalmers P., New Zealand	3 33	5½	4⅝	China Bakir, G. of Martaban.	3 3	16	11
Chamé B., New Granada	4 0	16		China St., New Guinea	8 40	6	4
Chamela B., Mexico, W.C.	8 7	5¼	3¾	Chiuchu Hr., China, E.C.	0 25	17	
Chamisso I., America, N. W. C.	4 42			Chin hai, Yung R., China, E. C.*	0 14	11	8¾
Champion B., Australia	9 0	1¾	1¼	Ching ho, G. of Pecheli	1 20	6½	
Champlain R., G. of St. Lawrence.	9 45	3	2	Ching-tau B., Yellow S.	6 0	12	9
Change I., Newfoundland.	7 20	4½	3	Chin ki I., China, E. C.	9 20	13	
				Chinkiang, Yang tse kiang.	8 30	3½	2¾
				Chino B., China, E. C.	8 0	5	2½
				Chipana B., Chile	9 19	5 ?	
				Chitando inlet, Java	6 30	5	3½
Chang tau, Chusan Arch.	10 14	12	9	Chittagong, B. of Bengal	1 12	13–15	7–10

† *See* note, page 180.　　* *See* note, page 196.

Q 2

Place.	High water, full and change.	Springs.	Neaps.	Place.	High water, full and change.	Springs.	Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Choiseul, P., Madagascar, E. C.	4 0	5		Cockburn P., Meiaco sima	7 32	6½	3
Chole B., Mafia I., Africa, E. C.	4 0	15	10	Cockburn, Australia, N. C.	5 45	1-4	
Chosan Hr. or Tsauliang-hai, Korea.	7 45	7	5	,, Sd., Australia, W. C.	9 0	1-1½	
				Cockenzie, firth of Forth, Scotland.	2 16	15¾	13
Christchurch, England .	{ 9 0 / 11 30 }	} 5		Cockle cove, Trinidad Chan.	11 45	5	
Christiania Hr., Norway .	5 34	1½		Cod, C., U.S.	11 30	13	
Christianstæd, Santa Cruz	7 30	¾		Codroy Rd., Newfound-land.	9 15	6	4
Christmas I., Indian O. .	7 20	4-5					
,, N. Pacific .	4 23	3¼		Coffin B., Australia, S. C.	0 45	6	
,, Mergui Arch.	10 44	16	9½	Coghlan Anch., America, N. W. C.	0 30	18	14
,, Hr., Ker-guelen I.	2 0	2		Coiba I., New Grenada .	3 10	12?	
Chuen pi Pt., Canton R..	noon.	7¾		Cold Spring inlet, U.S. .	7 32	5½	4¼
Chukun, China, S. E. C. .	4 30	20		Coleraine, Ireland . .	6 24	6¼	4
Chumpun B., G. of Siam	6 40?			Collier B., Australia, N. W. C.	11 45	36	
Churchill, P., Hudson B.	7 6	15½	11¾	Colne R. entr., England .	11 55	14	10
Churruca, P., Magellan Str.	1 0	6		Colnette B., California .	8 45	6?	
Chusan Arch., Vernon Chan.	9 40	14		Colombilla cay, Pearl cays, Mosquito C.	2 0	2	
Chusan Tinghae, China, E. C.	11 0	12	9	Colombo, Ceylon . .	1 50	2	
Cinque Is., Andaman Is.	9 47	7	4¾	Colon, Panama . .		1?	
Circular Hd., Tasmania .	11 40	9		Colonsay, Schallasaig, Scotland, W. C.	5 18	11	7½
Clam Pt., B. of Fundy .	8 27	8½	6½	Colorado R., La Plata .	4 0	9	7½
Clare I., Ireland . .	4 38	12¼	9½	,, entr., Cali-fornia.	2 15	25-30	16-20
Clarence, P., America, N. W. C.	4 25			Columbia B., G. of Darein	0 20	1½	
Clarence Hr., Long I., Bahamas.	8 30	4	2½	Columbia R. bar., America, N. W. C.	0 10	7½	6
Clarence R., S. Hd., Australia, E. C.	8 30	4?		Columbia R.,Marsh I. Cr.	1 20	4-7	
Clayoquot Sd., Van-couver I.	noon.	12		Comau inlet, Chile . .	1 10	17	13¾
				Comfort bight, Labrador	7 3	5½	2½
Clear, C., Ireland . .	4 0	9	6½	Comillas, Spain, N. C. .	3 0	12	
Clearwater Pt., G. of St. Lawrence.	11 30	5	3	Componi R., Africa, W.C.	10 0	15	11½
Clemenceau Pt., New Hebrides.	5 46	4¾		Comptroller B., Mar-quesas Is.	3 52	4½	
				Conani R., Brazil . .	6 38	19	
Cleveland B., Australia, E. C.	9 25?	8-12	4-8	Concarneau, France .	3 24	14	10½
Cleveland passage, Alaska	0 29	16	12¼	Congo R., Africa, W. C. .	4 30	6	
Cley, England, E. C. .		5½		Conil, Spain . . .	1 18	12	7½
Clifden B., Ireland, W.C.	4 30	13½	10	Connoire B., Nfld., S. C.	8 40	5¾	4
Clifton Sh., Sumatra,E.C.	10 0	4-5		Conquet Rd., France .	3 44	19½	14½
Clinton P.,Australia,E.C.	10 25	11-15	12	Constitucion cove, Bolivia	10 0	4	
Clonakilty B., Ireland, S. C.	4 30	11	8½	Convenient cove, Alaska .	0 34	13½	10½
				Conway,C.,Australia,E.C.	11 0	18	
Coacoacho B., G. of St. Lawrence.	10 30	5	3	Copiapo, Chile . .	8 30	5	
				Coquet Rd.,England,E.C.	3 0	14½	11
Coatzacoàlos R., ent. G. of Mexico.	irr.	1		Coquimbo B., Chile .	9 8	5	
Cobija B., Bolivia . .	9 54	4		Cordouan Lt. Ho., France	3 55	16¾	10¾
Cocagne R., G. of St. Lawrence.	7 30?	4?	2?	Corentyn R., Guiana .	5 10	8½	5½
				Coringa or Cocanada B., B. of Bengal.	8 50	5¼	3¼
Cochin R. entr., Hindu-stàn, W. C.	11 26	3	1½	Corinth canal, each end, Mediterranean.	5 0	¾	
Cockburn, P., Africa, E.C.	4 0	12	8	Corinto Hr., Central America, W. C.	3 6	11	
				Corisco B., Elobey isles, Africa, W. C.	5 0	7	

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Cork, Penrose quay, Ireland.	4 58	12¾	10
Corn Is., Mosquito C.	1 45	2	
Corner inlet, South Australia.	0 14	8	
Cornwall, C., England	4 35	18?	13?
Cornwallis, P., Andaman Is.	9 50	8	5½
Coromandel Hr., New Zealand.	7 0	8–11	
Corpach, L. Aber, Scotland.	5 59	11½	
Corral Pt., Chile	10 35	5½	
Corran, L. Linnhe, Scotland.	5 43	12	8½
Coruña, Spain	3 0	15	
Cosmoledo group, Indian O.	4 0?	8?	5?
Condres I., Prairie B., R. St. Lawrence.	4 25	18	13
Courrier B., Madagascar	4 21	10	
Courseulles, France	9 7	19	15
Courtmacsherry, Ireland	4 36	10¾	8¼
Courtown, Ireland		3¾	2
Coverack, England	4 35	14½	11¼
Cow Head Hr., Newfoundland.	10 30	6¾	4½
Cowes, England	{10 15 / 11 15}	}12½	9½
Coy inlet, Patagonia, E. C.	9 30	40	
Cozumel, B. of Honduras	8 30	1½	
*Cracker B., S. America, S. E. C.	7 15	13?	10?
Craig cove, New Hebrides	6 0?	5?	
Cranford B., Mulroy B., Ireland	8 3?	4	2¾
Crapaud, Prince Edward I.	10 0	8	6
Crémaillère Hr., Newfoundland.	7 13	4½	2¾
Crescent city, California.	11 33	5¾	4½
Crichton Hr., Korea, S. C.	9 30	12	9
Crinan, Scotland	4 49	6	3–4
Croc Hr., Newfoundland	7 4	4½	
Croisilles Hr., New Zealand.	9 0	12	8
Cromarty, Scotland	11 56	14	11
Cromer, England	7 0	14¾	11
Crooked I., Bahamas	7 0	2½	
Crookhaven, Ireland	4 9	9¾	8
Crow Hr., Nova Scotia	8 0	6¼	4½
Crowdy Hd., Australia, E. C.	9 15	5	3
Cucao B., Patagonia, W. C.	noon.	6	
Culdaff B., Ireland, W. C.	5 53	8¾	6
Culebra or Passage I., Caribbean S.	9 0	1	

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Culebra P., Central America, W. C.	3 15	5¾	
Culiacan R., Mexico, W. C.	9 30	6	
Cullen Hr., Fife Sd., British Columbia.	noon.	16	11½
Cullen I., Chile		20	
Cumberland basin, Sackville, B. of Fundy.	11 55	45½	38
Cumberland Is., Australia, E. C.	11 5	21	
Cumberland Sd., U.S.	7 48	6¾	6
Cupica B., New Granada	3 30	13	
Curanipe Rd., Chile	10–35	4	
Curieuse, Seychelles, Indian O.	5 10	7	
Curlew Hr., Labrador	6 40	5¾	4¼
Curtis P., Australia, E. C.	9 30	10–12	
Cutch, G. of mouth	11 30		
Cuttyhunk, U.S.	7 44	3¾	3¼
Cutwell Hr., Newfoundland.	7 6	4½	3
Cuxhaven, Germany	0 49	10½	7¾
Cuyo, Sulu S.	11 30	6	
Cypress Hr., Sharp passage, British Columbia.	noon.	16	11½
Cyrus Hr., Rotti I.	noon.	6?	
Dabhol, R., Hindustán, W. C.	10 40	8	5½
Daggs Sd., New Zealand	11 30?	8	6
Dahalak Bk., Red S.	1 10?	3–4	
Dahouet, France	6 5	32	23½
Daiwan I., China, E. C.	8 35	13½	
Daláwan B., Balábac I.	11 0	5	
Dalcahue, Patagonia, W.C.	0 26		
Dalhousie Hr., G. of St. Lawrence.	3 10	9	
Dalkey I., Ireland	10 45	13	
Dalrymple Hr., Sulu S.	7 50	4	
Daly, P., Australia, N. C.	5 30	17	2½
Daman, Hindustán, W.C.	1 30	17	
Dampier Arch., Australia, N. W. C.	11 30?	16–17	
„ Str., Moluccas	6 0	11	
Danes I., Spitzbergen	0 24	5½	
Danger Pt., Australia, E. C.	9 30	6	4½
Dapitan B., Mindanao	3 40?	5	
Darnley I., Torres Str.	9 30	12	
Dar-es Salaam, Africa	4 20	14	9
Dartmouth, England	6 16	14½	10½
Darwin Hr., Choiseul Sd., Falkland Is.	6 30	5½	

Place.	High water, full and change.	Rise.		Place	High water, full and change.	Rise.	
		Springs.	Neaps.			Springs.	Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Darwin P., Australia, N. C.	5 43	22¼	15½	Digges I., Hudson Str. .	8 53	8½	6¼
,, Chan., Patagonia .	0 35	10		Dilhi, Timor .	1 0	6	
Davao, Mindanao .	6 5	7	4	Dillon B., Erromango I., New Hebrides.	5 30	4	
De Roompot, Onrust, North S.	1 0	15	11	Dinding Chan., Malacca Str.	3 15	9	5
Dead Is., Labrador .	6 51	5½	3½	Dingle, Ireland .	3 51	10¾	7?
Deal, England .	11 15	16	12½	Dingwall, Scotland, E. C.	11 39	13	9?
Dealy I., Melville I.	1 48	4		Dinorwic, England, W.C.	9 35	18	13½
Deep Hr., Fife Sd., British Columbia.	noon.	16	11½	Dipcove, New Hebrides .	6 0?	5?	
,, Pt., Durian Str. .	5 0	10		Direction Hill, Magellan Str.	8 53	38	23
Deer Hr., Newfoundland	7 49	3½	2	Discovery Hr., Smith Sd.	11 35	6½	4½
,, Sd., Orkneys .	10 30	10	7½	Discovery P., America, N. W. C.	2 30	7	
Delagoa B., P. Melville, Africa, S. C.	4 30	15		Dislocation Hr., Tierra del Fuego.	1 40	4	
,, Portuguese factory.	5 20	12		Diu Hr.,Hindustan,W.C.	11 0	6	4½
,, Shofeen I. .	4 40	12		Dives, France .	9 39	21	16
Delaware R. (breakwater), U.S.	8 0	4½	3¾	Doani, Comoro Is. .	4 0	11–12	
Delfzyl, Holland .	11 15	10		Dobbo Hr., Aru Is.	2 30?	6	
Deli R., Malacca Str.	2 0	7		Doboy, Lt. Ho., U.S.	7 33	7¾	7
Demerara R., Guiana	4 28	9	6	Dodandowi B., Ceylon .	1 50	1½	
Denham Sd., Sharks B., Australia, N. W. C.	0 5	5		Dodo R., bight of Benin .	4 17	5	
Denial I., Australia, S. C.	0 50	7		Dok Kan, Sulu S. .	6 0	5	
Denison P., Australia,E.C.	10 20	8–10	6–8	Domino Run, Labrador (Grog I.)	7 23	5¼	3¼
Dent haven, Borneo, N. E. C.	6 34	3½		,, Hr. ,, .	7 4	5¼	3¼
D'Entrecasteaux Chan., Tasmania.	7 30	4½	3½	Donaghadee, Ireland .	11 13	11½	9½
Deogarh Hr.,* entr., Hindustan, W. C.	10 13	8¼	6¾	Donegal Hr., Ireland	5 18	11½	8½
Depuch isle, Australia, W. C.	10 40	14	10	Doris cove, Tierra del Fuego.	3 0	4	
Desire, P., Patagonia, E. C.	0 10	18½		Dornoch Rd., Scotland .	noon.	11	
Despair B., Newfoundland	9 15?	6		Do Son, Tong King G. .	5 0	10½	
Deutsche narrows, Patagonia, W. C.	0 18	2½		Douglas, isle of Man .	11 12	20¾	16
Devarenne Str., New Caledonia.		3¼		,, inlet, Korea	8 47	7½	5½
Devi R., entr., B. of Bengal.	8 54	9	6½	,, P.,Australia,E.C.	9 15	7–8	
Devonport dockyard, England.	5 43	15½	12	,, Rd., Bahamas .	8 30	4	2½
Dewinka R., New Guinea	12?	16?		Dourga Str., New Guinea		12–16	
Dhadar R., entr., Hindustan, W. C.	4 30	27	20–22	Dover, England .	11 12	18¾	15
Dhamra R., B. of Bengal	9 45	9½	6	Downham reach, Orwell R., England	0 27	12	
Diamond Hr., Hugli R. .	11 55	16½	12½	Dragamesti B., Mediterranean.	3 10	9?	
,, Pt., Malacca Str.	noon.	9		Drakes B., California .	11 33	5¼	4½
Diego Garcia, Indian O. .	1 38	5¾	3¾	Drayton Hr., St. Juan de Fuca Str.	2 0	12	
,, Ramirez Is., Tierra del Fuego.	4 0	6		Drogheda, Crook Pt., Ireland.	11 0	11¾	9
,, Suarez B., Madagascar.	3 33	6½	4½	Dry Hr., Jamaica .	8 45	1	
Diclette, France .	6 40	27	20¾	Duart, isle of Mull .	5 0	12	10
Dieppe, France .	11 8	27½	21	Dubla R., Hindustan,W.C.	10 10	8	
Digby gut, B. of Fundy .	11 0	27½	23	Dublin (bar), Ireland .	11 12	12–14	9–11
				,, North Wall basin	11 32		
				Duchateau Is., Louisiade Arch.†	9 0	5	3½
				Duck cove, New Zealand	10 50	10	6
				Dui Rd., Saghalin I. .	9 52	6–8	
				Dumbarton, Scotland .	0 20	10¼	
				Dumfries, Scotland .	noon.	6	

* *See* note, page 190. † *See* note, page 204.

Place.	High water, full and change.	Rise.		Place.	High water, full and change.	Rise.	
		Springs.	Neaps.			Springs.	Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Dunbar, Scotland . .	2 8	14½	11	Egmont B., Prince Edward I.	3 0	4	2
Dunbeacon, Ireland .	3 51	10¼	7½				
Duncansbyness, Scotland	10 14	10	7	Egmont P., Falkland Is.	7 30	11	
Dundalk, Ireland . .	10·56	15	11½	Eider R. entr., North S.	noon.	10	
Dundee, Scotland . .	2 32	14½	11½	,, Tonning .	1 55	11½	
Dunedin, New Zealand .	4 3	5½	4¾	Eidefjord, Færöe Is. .	11 0	9½	7½
Dungeness, England .	10 45	21¾	19	Eigg I., Scotland . .	6 15	14	11
,, Magellan Str.	8 30	36–44	30	El Rincon, Hr., Cent. America, W. C.	2 51	6¼	
Dunkerque, France . .	0 3	16¾	13½				
Dunkerron, Kenmare R., Ireland.	3 45	10½	8	Elbe, R. entr., Germany	noon.	11	
				,, Outer L. V.	0 15	9½	
Dunmanus Hr., Ireland .	3 57	9½	7¼	Elena, P., Cent. America, W. C.	2 30	5	
Dunmore Hr., Ireland .	5 27	12¼	9¼				
Durnford P., Africa, E. C.	4 25	12	9	Elizabeth B., Africa		5–6	
				,, Rf., S. Pacific .	8 30	8	5
Dusky Sd., New Zealand	11 15	10	6	Ellen P., Islay . .	5 0	5	4
,, cove, British Columbia.	1 0	13		Ellenwoods Anch., B. of Fundy.	9 54	13	10½
Dvina (bar), White S. .	5 50	3½		Emden, Germany . .	0 34	9	
Dyer I., Africa, S. C.	2 50	5		Encounter Rk., Yellow S.	10 44	11	8
Dyra F., Iceland . .	6 30	9–10	5–6	Endeavour, R.(Cooktown) Australia, E. C.	9 0	6–9	4–6
				Endeavour Str., Australia, N. C.	1 0	9½	
				Endermo Hr., Japan .	4 35	5	
				English Hr., Antigua		2	
				,, Narrows, Patagonia	0 15	6	
				Eran B., Palawan, China S.	10 10	6¼	
				Erme R., Bigbury, England.	5 40	16¼	11½
				Erqui, France . .	5 59	33¾	24½
				Erronan or Futuna, New Hebrides.	7 24	4	
Easdale, Sd., Scotland .	5 10	10–12		Escuminac Pt., G. of St. Lawrence.	4 10	4	2½
East, C., New Zealand .	8 55	7					
,, Pt., Prince Edward island.	8 30	3½	2	Eske F., Iceland . .	1 30	9	5
				Esmeralda cove, Chile .	9 20	5¼	
,, Alligator R., Australia, N. C.	8 15	15		Esperance B., Australia .	0 10	3–4	2–3
				Esperanza inlet, Vancouver I.	noon.	12	
,, London, Africa, S. C.	3 47	5	3¾	Espirito, Santo B., Brazil.	3 0	4	
,, Sandy cove, B. of Fundy.	10 33	21½	17¾	Espiritu Santo C., Magellan Str.	8 30	36–42	
Easter I., South Pacific .	0 39	irr.		Espiritu Santo I., New Hebrides.	6 0?	5?	
Ebon atoll, Marshall Is.	4 45	6					
Eclipse Hr., Labrador .		5		Esquimalt, St. Juan de Fuca Str.*	irr.	7–10	5–8
Ecrehos, France . .	6 32	31	22½				
Eddystone Pt., Tasmania	8 10	7		Essington P., Australia †	8 24	13	
Eden Hr., Patagonia, W. C.	0 15	6		Etches P., America, N. W. C.	1 15	9½	
Edgar P., Falkland Is. .	7 15	6		Eten Pt., Peru . .	4 0	3	
Edgartown, U.S. . .	0 24	2	1¾	Eucla Rd., Australia, S. C.	11 5	5	
Edye passage, America, N. W. C.	1 30	17–22	14–17	Euripo, Greece . .	5 15	2	
				Evangelists, Patagonia .	1 0	5	
Edina, Africa, W. C.	5 50	4		Exmouth, England . .	6 27	11	8½
Edmonstone I., Sherbro R., Africa, W. C.		8		Expedition B., Russian Tartary.	2 30	2½	
Egg I., Lt. Ho., U.S. .	9 4	7	5¾				
,, G. of St. Lawrence	2 0	11	6	Exuma, Bahamas . .	7 20	2½	2½

* *See* note, page 208.　　　　　　† *See* note, page 200.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Exploits Burnt Is. Hr., Newfoundland.	7 17	4¼	11 ?
Eyemouth, Scotland	2 15	15 ?	
Eyre P., Australia, S. C.	noon.	5½	
Fabre I., New Caledonia.	5 40 ?	6 ?	
Fair isle, Shetlands	11 0	5	3
Fairy P., Australia, S. C.	0 31	3	
Fajao D'Agua, C. Verde Is.	4 10	3½ ?	
Falkland Sd. (N. entr.), Falkland Is.	6 45		
Falkland Sd. (S. entr.)	7 0		
Fall Hr., Labrador	6 40	3½	
Falmouth, England	4 57	16	12
False Pt. Anch., B. of Bengal.	9 18	7	4
Famagusta, Cyprus	10 0	1½	
Famine P., Magellan Str.	noon.	6	
Famishgut, Newfoundland.	8 4	7	4¼
Fane I., Plumper Sd., Oregon.	irr.	12	
Fanning I., Pacific	6 15	2	
Fanny hole, Mulroy B., Ireland.	6 17	9¾	8
Fan si ak Chan., Canton R., China, E. C.	1 0	7¼	5
Farallones, California	10 40	4½	4
Fareham, Upper, England.	11 48	11¼	8½
Fareham bridge, England	11 51	7½	4¾
Farewell, C., New Zealand.	9 0	14	10
Farewell Hr., British Columbia.	1 0	15	8
Farquhar Is., Indian O.	4 0 ?	7 ?	5 ?
Fatsizio, Japan	6 0	5	
Fayal, Azores	11 45	4	
Fear, C., R., U.S.	7 19	5½	4¾
Fécamp, France	10 47	23½	18
Fenerive, Madagascar		3½	
Fenit, Tralee B., Ireland	4 3	12½	9¼
Feolin Ferry, Jura	4 41	6½	4¼
Fernando Noronha I., S. Atlantic.	4 0	6 ?	
Fernando Po, bight of Biafra.	4 0	7	
Ferriby sluice, R. Humber.	6 41	20¼	
Ferro, Canary Is.	0 30 ?	9 ?	
Ferrol, Spain	3 0	13¾	9½
,, B., Peru	5 50	2	
Ferryland Hr., Newfld.	7 20	5½	3½

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Ferryside, Eugland, W. C.	5 49	23	16¾
Fife ness, Scotland, E. C.	2 10	15	12
Fila Hr., New Hebrides	6 30	4	3¼
Filey B., England	4 16	15½	12¼
Finisterre, C., Spain	3 0		
Finlayson Chan., America, N.W. C.	noon.	12	
Fire I., Korea, S.W. C.	2 0	18	
Fish Hd., Grand Manan, B. of Fundy.	11 16	22½	18½
Fishing Ship Hr., Labrador.	6 54	5½	4
Fishguard, England, W. C.	6 56	12¼	9¼
Fitzroy I., Australia, E. C.	9 15	7-12	
Fitzroy P., Falkland Is.	4 45	6	
,, R. entr., Australia, N.W. C.	2 30	36	20
Fiume, Adriatic	8 30	1¼	
Flamand B., St. Domingo	irr.	2-3 ?	
Flamborough Hd., England.	4 30	16	12
Flamenco P., Chile	9 10	5	
Flat I., cove, Newfld.	8 27	6½	5
Flatholm I., Bristol Chan.	6 56	37¾	29
Fleetwood P., England	11 12	27	20½
,, Wyre Lt. Ho.	11 11	27½	20½
Fleur de Lis Hr., Newfld.	7 15	2-4	
Flinders B., Australia, S.W. C.	10 35	2¾	2
Flinders group, Australia, E. C.	9 15	8-12	
Flinders I., Bass Str.	10 30	10	
Florida, C., U.S.	8 36	1¾	1½
Flotten Hr., Patagonia, W. C.	0 50	5	
Flushing, Belgium	0 54	15	11
Fogo I., Newfoundland	7 15	4½	3
Folkestone, England	11 7	20	16½
Folly Pt., Petitcodiac R., B. of Fundy.	11 49	45	38
Forcados R., bight of Benin.	4 22	5	
Ford Hr., Paul I., Labrador.	6 46	6½	4
Forikaria R., Africa, W. C.	7 40	11	
Formby Pt., England	10 35	25½	19
Formosa Mt., off, Malacca Str.	8 30	11	8½
Fort Dauphin, Madagascar.	4 30	4-5	
Fort Dauphin, St. Domingo.	7 0	5½	3½
Fort Royal, Martinique	4 0	1-1½	
Forteau B., Labrador	10 25	5½	3
Fortescue Rd., Australia, N.W. C.	10 25	13½	8½

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Fortescue Str., New Guinea	8 0	4-5	
Fortune B., Patagonia, W. C.	0 50	7	
Fortune Hr., Newfoundland, E. C.	7 14	4	3
Forward Hr., British Columbia.	3 0	16	11½
Fossdyke bridge, England.		12	
Foulke P., Smith Sd.	11 14	10	7½
Foulness, Crouch R., England.	0 5	14½	10½
Foulwind, C., New Zealand.	11 15	6-8	
Four Hr., Nfld.	7 5	4	
Fow I., New Guinea		5	
Fowey, England	5 14	15	11¾
Fox B., Falkland Is.	7 0	6	
Fox I., Newfoundland	9 15	5½	3¾
Foyle L., Warren point, Ireland.	6 20	6½	5
Foynes I., Ireland	5 35	15½	12
France, P. de, or Noumea B., New Caledonia	8 25	4	
Franklin Hr., Australia	4 0	5½	
Fransway B., Newfoundland.	8 40	6¼	4¼
Fraser R. entr., British Columbia.	6 30 ?	7-10 ?	
Fraser R., New Westminster.		6	
Fraserburgh, Scotland	0 40	11	8½
Frechette I., R. St. Lawrence.	8 0	14	9
Frederick Rf., Australia	8 0	6	
Frederickshaab, Greenland.	6 22	9	5
Frederiken siel, Germany.	11 55	4	
Frenchman cove, Newfoundland, W. C.	10 0		
Frenchman cove, Newfoundland, S. C.	8 47	7	5½
Frenchman Run, Labrador.	7 13		3
Freshwater B., Newfld.	7 30	4	3
Freycinet estuary	4 15	3½	
" reach, Sharks B., Australia, W. C.	3 0	5	
Frio porto, Brazil	2 40	4½	
Frobisher B., N. W., arm, Davis Str.		45 !	
Fuerteventura I.	1 0?	9 ?	
Fuglofjord, Færöe Is.	11 15	6½	4½
Fukom Bonder, Arabia	10 0	8½	
Fumboni, Mohilla I.	4 30	13	
Funafuti, Ellice Is.	5 20	6¼	4¾
Funchal B., Madeira	0 48	7	
Funk I., Newfoundland	7 0?	2-3 ?	

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Funter B., Alaska	0 41	16½	12½
Fury Hr., Tierra del Fuego	2 30	4	
Fury I., Tierra del Fuego	2 30	4	
Fury and Hecla Str., Arctic regions.	7 0	8	
Gaalong B., Hainan I., China S.		4-5	
Gabo I., Australia, S. C.	8 50	6	
Gaboon R. entr., Africa	5 20	8	
Galaxidi P., Mediterran'n	5 0?	2½	1½
Gale B., Korea, S. W. C.	1 19	11	
Gallant P., Magellan Str.	0 34	8	
Gallegos, P., Patagonia, E. C.	8 50	46	
Gallinas R., Africa, W. C.	6 45	4	
Galloway, Mull of, Scotland.	11 15	15!	12?
Galveston, G. of Mexico	irr.	1	
Galway, Ireland	4 35	14¾	11
Gambia R., Africa, W. C.	9 10	6¼	5
Gambier B., Alaska	0 43	16¼	12¼
GambierIs., Australia,S.C.	2 0	5	
" S. Pacific	2 30	4	
Gander B., Newfoundland	7 55	4	3
Garia Hr., Newfoundland	8 50	5½	3¾
Garliestown, Scotland, W. C.	11 20	21	16
Garroch Hd.	11 49	10	
Gascoyne Rd., Australia, W. C.	10 15	5	3½
Gaspar Str., Eastern Arch.	2 30	4	
Gaspé basin, G. of St. Lawrence.	2 40	5	3
Gavutu, Solomon Is.	irr.	3½	
Gay Hd., U.S.	7 39	3½	2¾
Gebi, Fow I., Gilolo passage, Moluccas.		5	
Geelong Hr., Australia, S. C.	2 30	3½	2½
George C., Nova Scotia	9 15	4	2
" P., B. of Fundy	11 17	32	28
" shoals, U.S.	10 30	7	
" B., Tasmania	9 42	3	2
Georgetown, U.S.	8 40	4½	3½
Gets nai tau, Korea, W.C.	6 18	14	10¼
Ghubbet Hashish, Arabia	10 0	10	
Ghubbet Kharab, G. of Tajura	8 0 to 10 30	6	
Ghubbet Soghra, Red Sea	1 51	9	
Gibraltar, new mole	1 47	3½	2½
Gigha Sd., Scotland	2 22	4	2½
Gijon B., Spain, N. C.	3 0	14	11

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Gipps Land lakes, entr., Australia, S. C.	8 30	3	
Gisri R., Hindustán	9 45	7-10	
Glasgow, Scotland	1 8	11¼	9¼
Glasson dock, England	11 16	20	14
Glenan iles, France	3 24	14	10¼
Glennie isles, Australia	11 44	9	
Glorioso Is., Madagascar	5 0	10	
Gloucester, England	9 45?	4-7	
,, C., Tierra del Fuego.	1 30	5	
,, Hr., U.S.	11 2	10	9¼
,, passage, Australia, E. C.	10 20?	9	
Gluckstadt, Germany	2 52	10¼	
Goa B., Hindustán, W. C.	10 39	6½	5¼
Goapnath Pt. ,,	2 25	16	9-10
Godhavn, Greenland	9 0	7½	
Godthaab, Greenland	7 0	12	
Goeree gat, North S.*	2 0	7¼	
Gogha, G. of Cambay	3 58		
Gogo Sima, Japan	10 10	11	7¾
Golchika, R. Yenisei	0 0	1½	1
Gold Stream Hr., America, N. W. C.	1	15	12
Golovnin B., America, N. W. C.	6 23	3¾	
Gomera, Canary Is.	0 45?	9?	
Gometra, L. Tuadh, I. of Mull.	5 29	11¾	8
Gonaives B., St. Domingo	8 0?	1?	
Good B., Newfoundland	10 40	7½	5½
,, Hope C., China	9 0	6½	
,, News B., America, N. W. C.	6 15	13¾	
,, Success B., Tierra del Fuego.	4 3	6-8	
Goodbout R., R. St. Lawrence.	1 52	11	6
Goods B., Patagonia, W.C.	0 30	7	
Goold I., Australia, E. C.	9 35	8-11	7-8
Goole, R. Humber, England.	7 26	13	
Goose B., Newfoundland.	7 22	4½	2½
,, I., Bass Str.	10 48	9	
Gopalpur, B. of Bengal	9 40	6½	4½
Gorda Sd., Virgin Is.	8 30	1½	
Gore, P., New Zealand	9 0	8	6
Gorée, Africa, W. C.	8 8	5	
Goria Ck., Hindustán	11 19	8½-12	6-7
Goschen Str., New Guinea	8 0?	5?	
Goshkevitch B., Korea		3-4	
Goto Is., Japan	8 40	10¼	2-4
Goulburn Is., Australia, N. C.	6 0	5-6	
Goury, France	7 8	22	17¼
GowllandHr., Vancouver I.	5 30	11	
Graa deep, Denmark	2 32	5	17¼
Gracia Pt., Magellan Str.	10 17	8	

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Grand Cayman, Caribbean S.	9 25	1½	
,, Bk., Newfoundland	8 48	6¾	5¼
,, Bruit Hr., Newfoundland, S. C.	8 43	5¾	4
,, Hr., Grand Manan, B. of Fundy.†	11 7	21	17½
,, Lahu, Africa, W. C.	4 20	4	
,, le Pierre Hr., Nfld.	9 10	7	5
,, passage, B. of Fundy	10 43	20¾	17
,, P., Mauritius	0 30	2½	1¾
,, Rustico, Prince Edward I.	6 40	4	2
Grande Pt., Chile	9 45	5	
Granton pier, Scotland	2 20	16½	12¾
Granville, France	6 9	37	27¼
Gravelines, France	noon.	19	15½
Graves, Pt., Howe Sd.,‡ British Columbia.	noon.	12	
Gravesend, England	1 5	18¼	15
Gray Hr., Oregon	0 12	7	5¾
Great Barrier I. (Nagle cove), New Zealand.	6 25	10	7
Great Fish B., Africa, W.C.	3 0	5	3½
,, Jervis Hr., Nfndlnd.	8 55	6½	5
,, Karimon, Malacca Str.	11 0	12	
,, Laun, Nfndlnd.	8 15	7	4
,, St.Lawrence Hr.	8 30	7	4
,, Sandy Hr. ,,	8 9	6¾	5
,, ,, Str., Inskip Pt., Australia, E.C.	8 30	6	
,, Skerry, Pentland Firth, E. side.	11 4	7¾	6½
,, ,, W. ,,	10 53		
Greatman B., Ireland	4 39	15½	11¼
Green B., N.W.arm, Newfoundland.	7 9	4	3
,, I., R. St. Lawrence.	2 45	16	9½
,, Is., Korea	11 0	12	8¾
Greenock, Scotland	0 8	10	8¼
Greenwich, England	1 43	19	15
Gregory B., Magellan Str.	9 30	21	12
,, Group, Mergui Arch.	10 20	14	10
,, P., Australia, W. C.	11 30	3	
Grenada, St. George Hr., Caribbee Is.	2 40	1½	?
Grenadines, Caribbee Is.	3 0	1½	
Grenville, C., Australia	9 15	10	
Grey P., Australia, W. C.	9 0	1-1½	
,, R., New Zealand	10 15		
Greytown, Mosquito C.	9 0?	¾-2	
Gribanika Pt., White S.	4 50	3	
Griffin B., Haro Arch.	irr.	12	
Grilliths I., Barrow Str.	0 15	3¾	2¾
Grimsby, England	5 36	19¼	15½
Grindstone I., B. of Fundy	11 47	41	34½
Grisnez, C., France	11 27	21½	16¾
Grondine, R. St.Lawrence	9 0	9	6

* *See* note, page 176. † *See* note, page 184. ‡ *See* note, page 208.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Grosse I., R. St. Lawrence	5 21	19	13
Gruinard I., Scotland, W. C.	6 37	14½	
Grundar fiord, Iceland	4 45	14½	
Guadeloupe, Pointe à Pitre	10 0	1¼	
Guadiana R., Spain	1 57	12	
Guard Fish cluster, Australia, E. C.	11 20	14-18	
Guardafui, C., Africa, E. C.	6 15	6	
Guayaguayare B., Trinidad	4 25	7	4
Guayaquil, Ecuador	7 0	11	
Guaymas, Mexico, W. C.	8 0	4	
Guernsey, St. Peter P., English Chan.	6 37	26	18¾
Guia narrows, Patagonia, W. C.	2 10	8	
Guinchos cay, Bahamas	7 40	3	
Guichen B., Australia, S. C.	0 37	4	
Guizo I., Solomon Is.	irr.	6 ?	
Gun cay, Bahamas	8 30	3	
Gundevi R. entr., Hindustán, W. C.	2 0	19	15½
Gunfleet sand, England	11 50	12	8
Gutzlaff I., China, E. C.	11 30	15	
Guysborough, Nova Scotia	8 20	6½	4½
Gwa, B. of Bengal	10 30	6	
Gwadar B., Beluchistan	9 30	8-9	
Gwatar B.	9 30	8-9	
Gweedore, Bunbeg, Ireland.	5 32	11	8
Haast R. entr., New Zealand.	10 50	5-8	
Habitants Hr., C. Breton I.	8 20	6½	4¾
Hachken R., Japan	6 4	6½	
Hacking, P., Australia	8 45	7-8	
Hada B., San Cristoval I.	9 0	4-6	
Haddington, P., Meiaco Sima group.	6 45	7	
Haddummati atoll, Maldives.	3 0	4	
Haimun B., China, E. C.	9 0	6-7	
Hainan bluff ,,	10 35	6	4
Haining town, China	3 0	19	
Haitan Str., China, E. C.	11 23	24	18
Haiti, C., St. Domingo	8 0	3	

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Haiyun-tau, Thornton haven, Yellow S.	9 30	12	8
Hajamro R. entr., Hindustán, W. C.	10 19	9-10	
,, Keti ,,	noon ?		
Hakodate Hr., Yezo I., Japan.	3 37	3½	1 ?
Halifax, Nova Scotia	7 49	6	5
Hall Sd., New Guinea	9 15	5-7	2-3
Halls B., Newfoundland	7 16	5½	3½
Halt B. and Gray Hr., Patagonia, W. C.	0 15	5½	
Hamada, Japan	0 17	1¾	
Hamagema ura, Japan, S. C.	6 15	6	
Hamanaka B., Yezo	4 4	5½	3½
Hamburg, Germany	5 10	6½	5½
Hamelin B., Australia	9 49	2¾?	2
Hamilton, P., Korea	9 15	10½	7
Hammerfest, Norway	1 10	9	7½
Hammond knoll, England, E. C.	7 40		
Hampton Hr., Australia, N. W. C.	10 30	14½	9¾
Hanfela B., Red S.	1 21	3-4	
Hangata, Japan	10 36	11½	8?
Hanish Is., Red S.	1 0	2½	1
Hangchu B., Seshan Is., China, E. C.	11 45	14	
,, Chapu Rd.	noon.	25	
,, off Can-pu		32	
Hangchu town	3 01	6	
Hankau, China		38-50	
Hannibal Is., Australia	9 50	10-12	9 10
Hanover B., Australia, N. W. C.	11 30	24-38	
,, Sd., Bahamas	8 15	4	2¼
Hanstul, mouth, G. of Cutch, Hindustán.	1 40		
Hants Hr., Newfoundland.	7 13	4	2¼
Haramura ura	11 15	5¾	4
Harbour Breton, Newfoundland.	8 52	7	5½
,, Grace, Newfoundland.	7 25	4¼	3
Harchy B., Patagonia	1 30	10	
Hardwicke B., Australia	2 45	4-6	
Hardy, P., New Zealand	9 55	12	
Haro B., Newfoundland	8 38	7	
Harlingen, Zuider Zee	9 0	5½	
Haro Str., channels leading to, from St. Juan de Fuca Str.	irr.	10-12	
Harrington, P., England	11 15	25	19
Hartlepool, P., England	3 28	15	11¾
Harvey, P., Call creek, Vancouver I.	0 30	10	
Harwich, England	0 6	11½	9¾
Hassani I., Red S.	8 0		

Place.	High water, full and change.	Rise Springs.	Rise Neaps.	Place.	High water, full and change.	Rise Springs.	Rise Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Hastings, England . .	10 53	24	17½	Hillsborough R., Charlotte town, Prince Edward I.†	10 45	9½	8
,, Hr., B. of Bengal	10 40	14					
Hatteras inlet, U.S. .	7 0	2	1¾	Hillsborough R. (Hd. of river), Prince Edward I.	11 0	10	7
Hauling arm, Nfld. .	7 15	6	4	,, I., New port, Bonin Is.	11 32	3½	
Haute isle, B. of Fundy .	11 21	33	28½	Hillswick, Shetland Is. .	9 45	6½	5
Havana, Cuba . . .	8 14	3		Hime Shima Rd., Japan .	9 12	11¾	7¼
Havannah Hr., Efate (Sandwich) I., New Hebrides.	6 30	4	3½	Hinchinbrook Chan., Australia, E. C.	9 15?	9-11	7½
Haverfordwest, England .	6 42	7½	2½	Hirado Sima, Japan .	9 15	8	
Havre, France* . . .	9 18	22	18	Hirtshals, Jutland . .	4 28	1	
Hawke B., New Zealand	7 50	3		Hjerting, Jutland . .	2 45	4¾	
Hawke B., Newfoundland	11 0	6	4	Hobart, Tasmania . .	8 15	4½	3½
Head Hr., Newfoundland.	10 20	6¼	4½	Hohe Weg Lt. Ho., North S.	0 35	10½	
Hearts Content, Newfoundland.	7 33	4	2½	Hoi Hau, Hainan I.‡ .	7 0?	6-10	
Héaux Lt. Ho., France .	5 45	31	23½	Hokianga R. entr., New Zealand.	9 45	10	7
Heda Hr., Japan .	5 20	6		,, (Kokohu)	10 15	10	7
Hedland P., Australia .	11 0	19	12	Hokitika bar, N. Zealand	10 14	8½	4½
Helbre I., England .	11 0	26½	22	Hollesley, England .	11 30	8?	6?
Helford, England .	4 43	15½	11½	Holmes B., America, N. W. C.	1 0	13	10
Heligoland, North S. .	11 48	9	6	,, hole, U.S. .	11 43	1?	1½
Hell Gate ferry, U.S.	10 9	5½	4¾	Holsteinborg, Greenland .	6 30	10	
Hellevoetsluis, Netherlands.	2 30	5½		Holton Hr., Labrador .	6 44	5¾	4
Henlopen, C., U.S. .	8 16	5½	4½	Holy I., England . .	2 30	15	11½
Henrietta pass, Tong King G.	5 0?	10-12	4-6	Holyhead, England, W. C.	10 11	16	12½
Henry, C., U.S. . .	7 55	3		Holz haven, New Ireland	2 50	3¾	
,, P., Patagonia, W. C.	noon.	5		Hondeklip B., Africa, W. C.	2 30	5¾	
Hernando, I., Str. of Georgia, British Columbia.	6 0	12-14		Honfleur, France . .	9 29	23	18
Hermitage cove, Newfoundland.	8 45	7	4¾	Hong hai B., China, E. C.	10 0	6½	
Hermite isle, Australia .	10 0	14		Hongkong, China, E. C.§	9 0?	8?	6?
Heron islet, Capricorn group, Australia, E. C.	9 0	10		Hon Gnen, Cochin China.	11 0	9	
Herradura, P., Chile .	9 8	5		Hon Kohe B., Cochin China.	11 30	5	
,, Nicoya G. .	3 9	10		Honolulu, Sandwich Is.	3 40	2-3	
Herring gut, U.S. . .	10 58	10	8½	Hon Tseu, Cochin China .	9 30	2-4	
Herschel I., Mackenzie R. approach.		2½		Hood, P., Cape Breton I.	9 0	4½	2
Hervey B., Australia .	9 14	10	7	Hooksiel, Germany . .	noon.	11	
Hesquiat Hr., Vancouver I.	noon.	12		Hooper I., Korea, S. C. .	9 10	11½	8½
Hesteyre F., Iceland .	7 10?			Hope Hr., Falkland Is.	8 10	7	
Hewett B., Tierra del Fuego.	0 30	6½		,, Sd., Miau-tau group, Yellow S.	10 24	6½	
Heybridge, Blackwater R., England.	0 20	12	8	Hopedale, Labrador .	5 38	7	4
Heynish, Tiree I., Scotland.	5 30	12	6	Horn, C., Tierra del Fuego.	3 40	9	
Hicks B., New Zealand	9 0	7		,, Manukau, New Zealand.	10 50	14	5
Hi-ide, Japan . .	11 25	2-4		,, Rfs., North S. .	noon.		
Higbees, C. May, U.S. .	8 33	6¼	5¼	Horton bluff, B. of Fundy.	0 30	48	40
Highfield, America, N. W. C.		16		Hougue La, France .	8 53	19	14¼
				Hourdel, France . .	11 30	28½	22
				Hout B., Africa, W. C. .	2 20	5	

* *See* note, page 175.   † *See* note, page 186.   ‡ *See* note, page 195.   § *See* note, page 195.

Place.	High water, full and change.	Rise.		Place.	High water, full and change.	Rise.	
		Springs.	Neaps.			Springs.	Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Houtman Rks., Australia, W. C.	11 30	2½		Ihavandiffulu atoll, Maldives.	9 30	5	
How Hr., Newfoundland	7 18	4	1½	Ilfracombe, England	5 42	27¼	21¼
Howard P., Falkland Is. *	7 0	5		Iki, Japan		8	
Howden, R. Tyne, England.	3 23	15	11¼	Ilha Grande B., Paratio, Brazil.	1 45	5½	
Howe, West C., Australia, S. C.	9 0	2		Ilheo, P. d', Africa, W. C.	3 0	8-10	
				Iliuliuk, Aleutian Is.	3 50	5	
Howland I., N. Pacific	7 11	8		Ilo Ilo, P., Philippine Is.	noon.	5½	
Howth Hr., Ireland	11 9	13	10	Impul passage, Anamba Is.§	9 0	6	3½
Huacho B., Peru	4 45	3					
Huafo I., Patagonia, W.C.	noon.	7		Inagua, Bahamas	8 0	3½	2
Huahine, Society Is.		1		Indefatigable I., Galapagos.	1 56	6	
Huapilinao Hd., Patagonia, W. C.	1 25	15½					
				Independencia B., Peru	4 50	4	
Huarmey B., Peru	6 0	2		Independent Hr., Labrador.	6 51	5¾	4¼
Huasco P., Chile	8 30	6	4				
Hue R., Cochin China	noon.	1¾ to 5		Indian cay, Florida	8 23	2½	1¾
Huelva, P., Spain	1 54	14		„ River inlet	7 23	1½	
Hügli R., Eastern Chan. L.V., B. of Bengal.	8 43	10¾		„ Tickle, Labrador	6 37	6	4
				Indio Pt., S. America, E. C.		4	
Hugli R., Diamond Hr.+	11 45	16½	12¼				
Hui ling san, China	8 30	7½		Indus R., Gisri Bunder, Hindustan, W. C.	9 45	7-10	
Huildad inlet, Patagonia, W. C.	0 48	16-20					
				Inishbofin, Ireland	4 34	12¼	9½
Hu i tan B., China, E. C.	0 15	18		Inishturk, Ireland	4 36	12¼	9¾
Hnite P., Chile	0 54	10		Innamban R., Africa, E. C.	5 33	11	7
Hull, England	6 29	20¾	16¼				
„ bridge, Crouch R., England.	0 25	16	11	Inokushi P., Japan	6 8	5½	4½
				Insti Pt., White S.	11 55	16	
Hulu Shan B., Yellow S.	2 30	8	6	Inu-bo-ye saki, Japan	5 45	4½	3
Humboldt B., California	11 33	5½	4½	Inveraray, Scotland	noon.	10	
Hungry Pt., Australia, S. C.‡	4 18	7	4-6	Inverness, Scotland	0 18	12	9½
				Investigator Rd., Australia, N. C.	8 0	9	
Hungwha Chan., China	11 25	23					
Hunter I., Bass Str.	10 30	8		Iona Sd., Scotland	5 11	11¾	8¾
Hurst, England	10 0 noon.	7½	6	Ipswich, England	0 35	13½	
				„ U.S.	11 26	9	8½
Husum, Denmark	2 20	11		Iquique Rd., Chile	8 45	5	
Hut I., China, E. C.	11 20	14		Ireland I., Bermuda	7 14	4	
Hyannis, United States	0 31	3½	2¾	Isabela, Basilan Str.	8 18	2?	
Hyogo and Kobé B., Japan.	7 34	6½	3½	Island Hr., Falkland Is.	5 20	6	
				„ Country Hr., Nova Scotia.	7 40	6½	5½
Hytho pier, Southampton water	11 10 0 52	13¾	9¾				
				Islay, Peru	8 53	7	
				Isles do Los, Africa	6 35	13-17	
				Isthmus B., Smyth Chan.	1 30	5	
				„ Newfoundland	9 40	5¼	3½
				Itsuhara Hr., Tsu-Sima	8 50	6¾	4¾
Ibo, Africa, E. C.	4 15	11					
Icacos Pt., Trinidad	4 14	7	4	Jackson, P., N. Hd., Australia.	8 15	6	
Ice Tickle, Labrador	6 20	7	4				
Ichabo I., Africa, W. C.	1 0	6	4	Jacmel, St. Domingo	irr.	2-3 ?	

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Jafarabad, Hindustán	1 48	10½	7
Jaigarh, Hindustán, W. C.	10 16	8⅞	7¼
James I., N. side, Galapagos.	2 34	5	
,, West end	3 10	5	
,, R., City Pt.	2 11	3	2⅝
Ja shak B., Beluchistan	9 30	9	
Jean-de-Gaunt I., Newfoundland.	8 6	7	5
Jedore, Nova Scotia	7 45	6½	4½
Jei I., Aru Is.	4 20	5	3
Jerba I., Tunis	4 23	5¼	3¼
Jericoacoara, Brazil	5 15	8	6
Jervis B., Australia, E. C.	8 30	5	
Jezirat-Arabi, Persian G.	6 30 ?		
,, Hamar-al-nafur, Arabia, S.E. C.	9 30	10	
,, Hormuz, Persian G.	10 45	13	
,, Jun, Persian G.	9 30	10 ?	
,, Kubbar, Persian G.		8½	
,, Kais ,,	0 30	7½	
,, Kharg or Karag ,,	8 0	6 to 7	
,, Tanb ,,		8	
Jidda, Red S.		2 ?	
Jifatin ,,	6 0	2	
Jijginsk I., White S.	5 15	4	
Jiquilisco B., Central America, W.C.	2 38	7¼	4½
Johanna I., Anch.	4 30	14	
,, Pomoni Hr., Comoro Is.	4 30	14	9
John P., America, N.W.C.	1 0	13	
Jourimain I., G. of St. Lawrence.	9 30	6	3
Juan de Nova, Madagascar.		5	
,, Fernandez I., Chile	9 55	5½	
Juba R.	4 30	9–10	
Juby C., Africa, W. C.	noon.	10 ?	
Judith Pt., U.S.	7 32	3¾	3½
Juggi, Sir R., Hindustán.	1 30	6	
Juist, Germany	10 15	6½	
Juliansbaab, Greenland	5 6	7	5
Junction Chan.,Canton R.	2 0	6½	5½
Juncau Anchc., Alaska	0 45	18½	14
Junk Fleet entrance, Canton R.	11 50	6½	
,, R., Africa, W. C.	5 45	5	
Junkseylon I., E. side, Malacca Str.	10 10	9	7
Jura I., Small Is., Scotland.	5 3	3½	2½
,, Feolin ferry, Scotland.	4 41	6½	4½
Juria, Hindustán, W. C.	2 0	16	13
Jurien B., Australia, W. C.	9 0	2	1½

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Kabobotol Str.	6 0	4–6	
Kadalur, Hindustán, W.C.	10 47	5	4
Kadiak I., Alaska	11 47	12	
Kagayan Sulu, Sulu S.	6 10	6 ?	
Kagosima, Japan	6 50	10½	
Kaikoura Pen., New Zealand.	5 0	6	4
Kaipara Hr. entr., New Zealand.	10 55	10	8
Kaka Ura, Japan, W. C.	1 20	1¼	?
Kal Farun, G. of Aden	8 20	6	
Kalandorang Baläbac I.	11 0	6	
Kalang Bayang Hr., Sumatra.		2	
Kalgalakska, White S.	6 50	7	
Kalian Pt., Banka Str.	8 0	12	
Kalingapatam, B. of Bengal.	8 33	4⅞	3
Kamaishi Hr., Japan		3 ?	
Kamaran B., Red S.	10 0	3⅞	
Kamchatka R. entr., Kamchatka.	4 0	6	
Kami, C., Hainan Str.	2 45 ?	9¾ ?	7 ?
	P.M. summer A.M. winter		
Kamiguan I., Babuyan Is.	6 0	6	
Kandalaksha, White S.	3 25	7	
Kankasanturai, Ceylon	7 35	3	2
Kannanur, Hindustán	10 51	4½	3½
Kansala, R. Gambia	0 5	6	3
Kauushin C., White S.	11 54	15	
Kao tao shan Is., Tong king G.	7 8		
Kapiti I., New Zealand	9 0	6–8	
Karachi, Hindustán,W.C.*	10 19	9½	5 to 6
Kar Nicobar I.	10 0	5	
Karikal, B. of Bengal	9 0	4¼	2
Karimata Anch., Meiaco sima.	7 41	6¾	4½
Karlandagan Is., Pálawán	9 30	6	
Karwar, Hindustán, W.C.	10 36	6¾	4½
Kasa Ura, Japan, W. C.	1 20	1¼	⅞
Kasaan B., Alaska	0 30	16½	12½
Kasamanze R., Africa	7 40	5½	
Katbalogan, Samar I.	0 21	3–6⅞	
Kathleen Anch.,Patagonia	noon.	6	4
Kats ura., Japan	5 10	5½	
Katwyk, Netherlands	2 30	5	
Kauai I., Sandwich Is.	3 45	2½–3	
Kawau Is., New Zealand	6 30	10	7
Kawhia Hr., New Zealand	9 30	12	
Ké Dulan, Arafura sea	1 25	7	
Kealakekua, Hawaii	3 49	2 ?	
Keats P., Australia, N. C.	6 0	22	
Kedah, Malacca Str.	noon.	9	
Kediwara ent., Indus R..	10 19	9–10	5–8
Keeling Is., P. Refuge, Indian O.	5 30	5	
Kega Pt., Cochin China.	noon.	13–14	3
Kegashka B., G. of St. Lawrence.	10 45	5	

* See note, page 189.

Place.	High water, full and change.	Rise Springs.	Rise Neaps.	Place.	High water, full and change.	Rise Springs.	Rise Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Kelung Hr., Formosa	10 30	3		Kingston, Australia, S. C.	0 6	5	
Kenmare R., W. cove, Ireland.	3 52	10	7½	Kingstown, Ireland	11 12	11¼	8¾
Kenn Rf., Australia, E. C.	8 0	5½		Kin hon Hr., Cochin China.	irr.	4¼–5¼	2–3½
Kennebec R., Hanniwells Pt., U.S.	11 15	9	7½	Kinkuwasan Chan., Japan	5 30	5	3¼
Kent group, Bass Str.	10 15	8		Kinsale, Ireland	4 43	11½	9
Kentish Knock, England	11 47			Kircubbin, Ireland	0 42	11½	9½
Keonga S., Africa, E. C.	4 10	12		Kirindi, Ceylon	3 30	2	
Keppel B., Australia, E.C.	9 0	9–14		Kiriwina Is.	5 0?	3	1
Kerama Chan.,Liu Kiu Is.	6 43	5¾	4	Kirkcudbright, Scotland	11 10	23	17
Keret, White S.	3 8	6		Kirkwall, Orkneys	10 20	8½	6½
Kerets Pt., White S.	4 30	5½		Kirpon Hr., Newfoundland.	7 5	5	1½
Kerguelen I., Indian O.	2 0	2		Kishm, Persian G.	11 0	12	
Kerkenah Bks., Tunis	4 32	2	1½	Kisimayu B., Africa, E. C.	4 0	10	6
Kero Nyuni pass, Africa, E. C.	4 15	13	8	Kiswere Hr., Africa, E. C.	4 25	12	
Kettle cove, U.S.	7 48	5	4½	Kiu kiang, China		24–40	
Key West, G. of Mexico	9 30	1½	1½	Klaskino inlet, Vancouver I.	noon.	12	
" " N.W. Chan.	9 10	1½	1½	Klaskish inlet, Vancouver I.	noon.	12	
Kheum Wolmi, Korea, W. C.	4 42	29¾	24½	Klemtoo passage, America, N. W. C.	noon.	13	8
Khorash Shem, Persian G.	10 40	8½		Klewnugget inlet, America, N. W. C.	0 30	17	
Khor Jarama, Arabia	9 30	10		Knox B., Vancouver I.	noon.	16	
" Rabiji, Beluchistan	10 10	9½	3	Knysna Hr., Africa, S. C.	3 30	6–7	
Khor-al-Hajar, Arabia	9 30	10?		Koajiro, Nipon, S. C.	5 18	6½	4½
Khori Ck., Indus R.	10 19	8½–12	6–7	Koepang, Timor	11 0	9	6½
Khorya Morya B., Arabia	8 20	6½		Koh Sechang Hr., G. of Siam.	6 30?	9½–11½	6½–8
Kilbaha, Ireland	4 16	13	9½	Kohukohu, New Zealand	10 15	10	7
Kildin I., Lapland	6 45	12		Kokotoni Hr., Zanzibar	4 10	15	
Kilifi, Africa, E. C.	4 0	12	8	Kokuntau group, Korea	2 32	20	15
Kiliman R. entr., Africa	4 20	12½	7½	Koksi P., Formosa	11 30	3	
Kilkieran cove, Ireland	4 34	15½	11	Koombanah B., Australia	9 0	2	
Killala B., Ireland	5 22	10½	8	Koos B., Oregon	11 55	6	4¾
Killary B., Ireland	4 30	12½	9½	Kori Lakhpat, town	0 15	12	
Killeany B., Arran Is., Ireland	4 28	13½	10	Kosair, Red S.	6 0	3	
Killerton Is., New Guinea	11 30	3½?	2	Koshiki Is., Japan	7 41	7½	3–5
Killingholme, Humber R., England	6 2	19¾	15¾	Kottaipatam, Palk Str.	11 0	1¼	
Killybegs, Ireland	5 16	11¼	8½	Kouloi R., White S.	1 15	20	
Killyleagh, Ireland	0 40	11	9½	Kou Zomen, White S.	3 30	6	
Kilmichael Pt., Ireland	8 0	4½	2¼	Kovda B., White S.	3 25	6	
Kilrush, Ireland	4 42	14	10½	Kowie R., Africa, S. C.	3 50	4–5	3
Kiltan I., Laccadives	10 30	7	4	Krakatoa I., Sunda Str.	7 0	4	
Kilwa Kisiwani, Africa, E. C.	3 45	12	7½	Krimon Is., Java S.‡	8 0	6	5
Kinabatangan R., Borneo	11 17	5½		Kuantan R., Malay Pen.		8?	
Kincardine, firth of Forth, Scotland.	2 53	17¾	15	Kubbat Ghazira, Persian G.	9 30	10	
King I., Franklin Rd.:* Bass Str.	0 48	3		Kudat Hr., Borneo	10 0?	6–8	
" Sea Elephant B.	0 50	3		Kudi R., Hindustan,W.C.	9 50	10	
" P. Falkland Is.	8 30	5		Kula, New Georgia	irr.	3	
" George Sd., Australia, S. C.†	11 3	2½	2	Kulewatte B., Moluccas	1 0?	7	
Kingua fiord, Cumberland Sd.	6 0	20		Kum sing mun Hr., China, E. C.	0 6	6½	5½
Kings cove, Newfoundld.	7 15	3¼	2¼	Kupchi, China, E. C.	7 45	5	4
Kingsbridge, England	5 46	10		Kuper Hr., Korea, S. C.	9 28	11½	8¼
				" P., America, N.W.C.	1 40	13	10½
				Kusaie I., N. Pacific	6 0	4½?	

* *See* note, page 201.   † *See* note, page 202.   ‡ *See* note, page 192.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Kussilof R. entr., America, N. W. C.		18-28		Lancaster, England	11 16	8½	2
Kutabdia I., B. of Bengal	11 56	13	8	Landshipping, Cleddau R., England, W. C.	6 27	20	14½
Kuweit, Persian G.	0 15	9		Langeoog, Germany	11 35	8	
Kwala Klang, Malacca Str.	5 0	14 ?		Langksa B., Malacca Str.	11 30	7	
Kwang-lo I., Yellow S.	9 55	12	8	Langshan crossing, Yang-tse-Kiang.†	1 40	12	8
Kwoibo R., Africa, W. C.		6		Langston, England	11 40	13½	10½
Kyau-chau B., Yellow S.	5 0	12	9	Lankit I., Canton R., China	11 20	6½	5½
Kyauk Pyu Hr., B. of Bengal.	10 0	9	6	Lanzarote, Canary Is.	1 0?	8	
Kyem R., White S.	5 23	4		Laredo B., Magellan Str.	11 0	7	
Kyle Akin, L. Alsh, Scotland.	6 16	15½	11	Largs, Scotland	11 50	10	
Kyle Rhea, Scotland	6 0	15	11	Latham I., Africa, E. C.	4 0	12	
Kynumpt Hr., America, N.W. C.	0 30	14	11	Latitude B., Tierra del Fuego.	2 5	4	
Kyuquot Sd., Vancouver I.	noon.	12		Lau-mu ho, Yellow S.	1 30	5	
				Laura Hr., Tierra del Fuego.	1 0	6	
La Hune B., Newfndland.	8 40	6¼	4¼	Laurenny, England, W. C.	6 23	20	14½
,, Paz Hr., G. of California.	10 0	4¼		Lautour P., New Hebrides	6 11	4	
,, Perouse Str., Japan	10 30	6		Lavata B., Chile	9 20	5	
,, Poile B., Newfoundland.	9 0	6	4	Lawrence, Great St., Hr., Newfoundland.	8 30	7	4
,, Trinité B., Martinique.		1½		Lazaref, P., Korea	5 20	2½	
Labu Pt., Banka Str. *	11 0	10		Lazy B., Alaska	2 28	8¼	
Labuan I., Victoria Hr., Borneo.	9 45	6	4½	La Have, C., Nova Scotia	7 48	7	5¾
Labuk B., Borneo, N. E. C.	9 30	8	5	,, Crooked Chan.	7 51	7¼	6
Labyrinth Is., Andaman Is.	9 24	6½	3½	,, Moshers I.	7 51	7	5¾
Labyrinth Is., Magellan Str.	0 30	5½		,, Getsons cove	7 55	7¼	6
Lacepede Is., Australia, N. W. C.	noon.	20		,, Bridgewater	8 6	8	6
Lacht Kuen R., Tong-King G.	10 0	7-9		Le Maire Str., Tierra del Fuego.	4 0	7	
Lacht Tran, Tong King G.	8 50	10		Leading Tickles, Newfoundland.	7 7	4½	3
Lacrosse I., Australia, N. W. C.	6 33	18-24	14-17	Lebu R., Chile	10 30	5	
Lady B., Australia, S. C.	0 37	3		Leervig Fiord, Færoe Is.	0 30	6½	4½
,, Elliot islet, Australia, E. C.	9 0	7-8		Lofuka, Tonga Is.	7 17	5	3¾
Lagos, Portugal	2 7	13		Leith, Scotland	2 17	16½	12¾
,, R. bar, bight of Benin.	5 0	3	2	Leman and Ower L. V., England, E. C.	7 15	9	
,, Consulate wharf		2		Lennox cove, Tierra del Fuego.	3 40	8	
,, Palaver Is.		1		Leopold, P., Barrow Str.	0 10	5	
Lagnimanok, P., Luzon	1 30	5½		Lepreau, B. of Fundy	11 18	24½	21
Laguna de Terminos, G. of Mexico.	noon.	1½		Lequeitio, P., Spain, N. C.	3 0	10¾	8
Lagunas, P., Patagonia	1 10	7		Lerwick, Shetlands.	11 5	5¾	4½
Lakon Rd., G. of Siam	10 15	4½ ?		L'Etang Hr., B. of Fundy.‡	11 19	23½	20
Lamalin, Newfoundland	8 25	7¼	5½	Leven P., Madagascar	3 30	7½	
Lambayeque Rd., Peru	4 0	3		Levrier B., Africa, W. C.	noon.	6-7	
Lamlash, Scotland	11 49	10	7	Lézardrieux, France, N. C.	5 53	32¾	23¼
Lamu Hr., Africa, E. C.	4 40	11	7	Liant C., G. of Siam	5 7	6½	
				Liau Ho., bar, Yellow S.	4 0	11½	7½
				,, (Yin-koa)	5 0	12	
				Liau-tung G., Sand Pt., Yellow S.	4 50	7	5¾
				,, N.W. Hd.of gulf	5 30	10	8¾
				Libás P., Samar I.	6 10	3-7½	
				Libertad, Central America, W.C.	2 50	10 ?	

* *See* note, page 192.   † *See* note, page 196.   ‡ *See* note, page 184.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Libreville Gaboon, R.	5 20	8		Lloyd P., Bonin Is.	6 8	3	
Liefkenshoek, North S.	3 25	16½	11½	Loango B., Africa, W. C.	4 13	6½	
Likuri I., Fiji Is.	6 30	4¼	3¾	Lobos C., Chile	8 0		
Limbé Str., Moluccas		5		Lobos cay, Bahamas	7 40	3	
Limerick, Ireland	6 10	18¾	13¼	,, Hd., Patagonia, W. C.	0 29		
Limpopo R., Africa, E. C.	4 20	11		Loch Aline, Scotland	5 33	13¾	10½
Linao B., Chile	0 24	8		,, Alsh, Scotland	6 16	15½	11
Lincoln P., Australia, S. C.	1 50	6		,, Boisdale, Scotland	5 47	12¾	9½
Lindi R. entr., Africa, E. C.	4 5	11		,, Broom, Scotland	6 40	14½	10½
Linja, Persian G.	noon ?			,, Carron, Scotland	6 29	16½	11½
Lintin I., Canton R., China.	noon.	7½		,, Clay, Scotland	6 9	14¾	9½
				,, Cuan, Scotland	5 36	13	9½
Lisbon, Belem, Portugal	2 30	12	9	,, Duich, Scotland	6 0	15½	11
Liscanor B., Ireland	4 23	13¾	10	,, Dunvegan, Scotland	6 7	15¼	11
Liscomb Hr., Nova Scotia	8 0	6½	4½	,, Eil, (Hd. of loch) Scotland.	6 27		
Lishan B., China, E. C.	10 15	16		,, Eport, Scotland	6 6	12½	9¾
L'Islet, R. St. Lawrence	5 11	18	12¾	,, Eriboll, Scotland	7 43	14¼	11
Lissa, Adriatic	4 10	2½		,, Erisort, Scotland	6 13	15¼	11½
Listerdeep, Fairwaybuoy, Denmark.	0 30	5½		,, Etive, Stonefield, Scotland.	7 3		
,, Rd., Denmark	2 0	6½		,, ,, Bunawe, Scotland.	7 54	5¾	
Litau B., Yellow S.	3 0	6	4	,, Ewe, Scotland (Hd. of Loch).	6 39	14½	10½
Lith, Red S.		2		,, Eynort, Scotland	6 0	12	
Litke ridge, White S.	11 45	15		,, Fleet, Scotland	noon.	10¾	
Little B., Newfoundland	7 22	4½	3	,, Goil, Scotland	0 6	10	6
,, Egg Hr., U.S.	7 50	4½	3½	,, Harport, Scotland	5 54	13¾	10
,, Fish B., Africa, W. C.	2 30	5-6?		,, Hourn, Scotland	5 45	13¼	10¼
,, Gull I., U.S.	9 38	3	2¾	,, Inver, Scotland	6 40	14	11
,, Hr., Labrador	7 4	4½		,, Laxford, Scotland	6 44	15	11¼
,, Metis, R. St. Lawrence.	2 10	13	8	,, Leven, Scotland	6 28		
,, Milford quay, England, W. C.	6 31	19	13½	,, Linnhe, Scotland	5 26	12½	8½
,, Natashquau Hr., G. of St. Lawrence.	11 0	5	3	,, Long, Scotland	0 6	12	
,, Pinchgut, New-foundland.	7 51	7	5	,, Maddy, Scotland	6 6	12½	9½
,, Placentia, New-foundland.	7 58	7	4¼	,, Moidart, Scotland	5 44	13½	9½
,, R., Newfoundland	8 40	6¼	4	,, Nevis, Scotland	5 47	14½	10
,, R., U.S.	10 58	15¼		,, Roag, Scotland	6 11	11	8
,, Tancock I., Nova Scotia.	7 43	7¼	6	,, Ryan, Scotland	11 12	11	8
Littlehampton, England	11 20	16	11½	,, Skiport, Scotland	5 52	12½	9
Liverpool, England	11 23	27½	20¼	,, Suizort, I. of Skye	6 8	14¼	10
,, N.W. L. V., England.	11 0	25	20	,, Strivan, Scotland	11 55	6	
,, B., Nova Scotia	7 50	8	5	,, Sunart, Scotland	5 40	13½	
,, Pt., U.S.	5 57	2-3		,, Tarbert, West, Harris, I.	6 4	11¾	8½
,, P. Madagascar	4 27	8		,, ,, East .	6 10	13½	10
,, R., Australia	6 30	12		,, ,, West, Argyleshire.	2 30	1-4	
Lizard I., Australia, E. C.	9 0	7-9	6	,, ,, East .	11 53	9	
,, Pt., England	5 0	14¼	10¼	,, Tongue, Scotland	7 53	15	12
Llandwyn I., England,	8 58	14¼	10¼	,, Torridon, Scotland	6 20	15	11
Llanelly bar, England,	6 16	25	18¼	,, Tuadh, Scotland	5 29	11¾	8
Llico, Chile	10 0	4-5½		Lofoten Is., Norway	0 31	9½	7½
Lloyd Hr., Long I. Sd., U.S.	11 1	8¼	7¾	Lohoiya, Red S.	1 30	3	
				Lomas Pt., Peru	8 19	5	
				Lombock, Ampauam B., Java S.	8 0	6	
				London Bridge, England	0 58	20¾	17¼
				,, Docks, England	0 53	20¾	17¼

R

Place.	High water, full and change.	Rise.		Place.	High water, full and change.	Rise.	
		Springs.	Neaps.			Springs.	Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Londonderry, Ireland	8 1	7¾	5¾	Macuse R., Africa, E. C. .	4 20	14	12
Long Hr., Newfoundland	8 50	9	5½	Madame I., Madagascar .	4 0	5	
,, Pt., New Zealand .	6 0	5	4	Madeleine I., Tong King G.	5 0?	12–15	5–7½
,, reach, Korea, S. C.	10 0	14	9	Madoc P., England, W. C.	7 35	15¼	10¾
,, sand, England, E.C.	11 50	12	8	Madras Rd., Coromandel	9 1	3½	2¼
Looe, East, England	5 26	16¾	13¼	C.			
Lookout Pt., U.S. .	0 32	2	1¼	Madryn, P., S. America,	7 15	13½	10
Lopez, C., Africa .	4 30	4–6 ?		S. E. C.			
Lord Howe I., S. Pacific .	8 30	6		Madura Str.† . . .	10 to 12	5–8	2–4
Lo-shan-kau, Yellow S. .	4 30	11	9	Magdalen Is., G. of St.	8 20	3	2
Lough Larne, Ireland .	10 48	6¾	6¼	Lawrence.			
,, Rossmore, Ireland .	5 20	11	8	,, R., R. St. Law-	1 15	6–8	3–4
Louis, P., France .	3 24	14	10½	rence.			
,, Mauritius	0 30	3	2	Magdalena B., California	8 25	5½	4¾
Louisburg Hr., Cape Bre-	8 0	5	4	Mahajamba B., Madagas-	4 30	11¾	8
ton I.				car.			
Low B., Falkland Is. .	5 0	5½		Mahé I., Indian O.‡	4 32	3½–5	3 ?
,, P., Patagonia, W. C.	0 40	7		Mahon R., U.S. .	9 10	7	6
Low Wooded I., Australia,	8 41	9	7	Mahone B., Nova Scotia.			
E. C.				,, Heckman	7 45	7¼	6
Lowe inlet, America,	0 30	17	15	Anch.			
N. W. C.				,, Princes inlet.	7 42	7¼	6
Lowestoft, England*. .	9 57	6½	5¼	,, Ham I. .	7 47	7¼	6
Lucipara pass, Banka Str.	irr.	10	7½	,, Martin R. .	7 43	7½	6½
Lundy I., England . .	5 15	27	20	,, Chester	7 44	7	5¾
,, Korea, W. C.	4 20	30		Mahurangi, New Zealand	7 0	10	
Lunenberg, Nova Scotia .	7 54	7¼	6	Mabuwa, Hindustan, W.C.	2 22	13½	9½
Lung-mun Hr., Yellow S.	10 0	7		Mai I., New Hebrides .	6 30	5	
Luasin Piccolo, Adriatic .	8 26	1		Maiden rocks, Ireland,	10 43	6¾	6¼
Lyme Regis, England .	6 21	11½	8½	N.E. C.			
Lymington, England .	{ 10 25	8	6	Maiko, fort, Japan . .	6 27	3½	2¾
	{ 0 15			Maimtirano, Madagascar,	4 45	16¼	11¼
Lynmouth, England .	6 2	30½	21¾	W. C.			
Lynn deep, England .	6 0	23	16½	Maizuru, Nipon, W. C. .	2 40	2½	
,, Hr., England .		22½		Makada Hr., Duke of	9 10	2½	1
,, Rd., England .		23½		York I.			
Lyttelton, P., New Zea-	4 13	6¼	6	Makambi, Madagascar .	4 27	11	7¾
land.				Makatein, Arabia, S.E. C.	9 0	6	
				Makalla, Arabia, S. E. C.	8 30	7	
				Makassar, Celebes . .	4 40	5½	
Mabou R., C. Breton I. .	9 0	4		Makawar I., Red S. .	0 30	2	
Macahé, Brazil . .	2 30	9½		Makira B., San Cristoval I.	6 45	2	
Macao, China, E. C. .	10 0	6½		Makongai I., Fiji Is. .	6 0	4	3
Macdonnel, P., Australia,	0 2	5		Makung Hr., Pescadores .	10 30	9½	7
S. C.				Malubrigo, Rd., Peru .	5 0	2	
M'Arthur, P., America,	0 5	10¾	8¼	Malacca Str., L. V., One	6 0	15	12
N. W. C.				fathom bank.			
M'Dougall Hr., Africa,	2 30	5¾		,, ,, Dinding R.	3 15	9	5
W. C.				,, ,, off Mt. For-	8 30	11	8½
M'Laughlin B., America,	1 0	14	8–10	mosa.			
N. W. C.				,, Rd., Malacca Str.	7 30	11	8½
Maceio, Brazil . .	4 30	8½		,, North sands	5 30	15	12
Machias, Seal I., B. of	11 5	18	14¾	Malaga, Spain . .	2 30	3	
Fundy.				Malahide inlet, Ireland .	11 15	10	8
Mackau I., Korea .	1 30	10¾		Malamocco, P., Adriatic .	10 30	2¼–4	
Mac Leay R., Australia,	9 15	5	3	Malaupaina I., Solomon	3 25	3–4	2–3
E. C.				Is.			
Macquarie Hr., Tasmania	7 30	3		Malcolm atoll, Maldives .	10 30	3	
,, P., bar, Aus-	9 15	4	3	Maldon, Chelmer R., Eng-	0 32	10	6
tralia, E. C.				land.			

Place.	High water, full and change.	Rise. Springs.	Neaps.	Place.	High water, full and change.	Rise. Springs.	Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Maldonado, Mexico, W.C.	3 10?	8?		Marina I., New Hebrides	6 19	3¾	3
Malé, Maldives	0 30	3		Marion B., Australia, S. C.	2 5	4	
Malindi P., Africa, E. C.	4 5	12½	9¼	Maristow, R. Tavy, England.	5 47	8½	4½
Malpelo Pt., Peru	4 0	10		Marjoribanks Hr., Korea, W. C.	3 30?	29	
Malta	3 30	1?		Marka or Muerka, Africa, E. C.	4 30	8	
Malwan, Hindustán, W.C.	10 1	7½	6	Maroni B., Comoro Is.	4 53	10	
Mana I., New Zealand	7 0	8	6	,, R., Guiana	5 0	9	6
Manao B., Chile	0 7	7		Marovo lagoon, Solomon Is.	irr.	4	
Manava cay, Fijis	6 2	6¼	3-4	Marovoay, Madagascar, W. C.	7 0	11¾	8¼
Manawatu R., New Zealand.	9 50	6	4	Martaban, B. of Bengal	2 20	21	
Manda B., Africa, E. C.	4 0	10	7	Martin Vas Rocks, S. Atlantic.	3 45		
Mandinga Hr., Central America.	0 50	7		Mary R. en?r., Australia, E. C.	9 45	9-12¾	7-10
Mandvi Rd., G. of Cutch	11 33	15	11	Maryport, England	11 26	25	19
Maudvi B., Hindustán	0 0	8	6	Masampho Hr., Korea	4 51	30	22
Manea, Africa, W. C.	7 40	11		Maskat, Persian G.	9 15	6-9	
Mangalore, Hindustán, W. C.	11 0	7	5	Mason B., New Zealand	1 10	8	6
Mangalum I., China S.	11 0	5		Massacre B., Tasman corner, New Zealand.	8 45	13	9
Manganitu B., Moluccas	5 0	6		,, Motu Pipi R., New Zealand.	9 50	14	10
Mangrol Bandar, Hindustán, W. C.	10 30	7	5	Massawa, Red sea	1 0	4	3
Mango I., Fiji Is.	6 10	4¾		Masulipatam, B. of Bengal	9 15	5½	3¼
Mangonui Hr., New Zealand.	8 0	7	5	Mata, P., Cuba	6 49	2¾	
Mangrove R., New Zealand.	7 21	7	5	Matacumbe B., Lower, U.S.	8 23	2½	1¾
Manicouagan R., R. St. Lawrence.	2 15	12	7	Matane R., R. St. Lawrence.	2 15	11	7
Manila, Luzon I., Philippine Is.	10 40	3½-6		Matanza, Chile	9 50	5	
Manning R., Australia, E. C.	9 15	4		Matauzas, Cuba		2½	
Manoel Luiz Rf., Brazil	5 0	12		Matava B., New Britain*	mid.	3½	
Manta, P., Ecuador	3 4	6		Matoya Hr., Japan	6 50	6	
Manua, Navigator Is.		6		Matsu, China, E. C.	10 22	20½	16
Manukau Hr. entr., New Zealand.	9 30	13	10	Matsushima B., Japan	5 30	4¾	3¾
Manybranch Hr., Falkland Is.	7 40	7½		Matuku, Fiji Is.	6 18	5	3
Manzanillo B., St. Domingo.	7 0	4-5?		Maui I., Sandwich Is.	3 0	3	
,, P., Cuba	10 40	4		Maule R., Chile	10 0	5	
Maple B., Vancouver I.		12		Maullin R., Chile	0 30	8	
Maplin L. Ho., England.	0 5	14	10	Mauritius, P. Louis	0 30	3	2
Maracaibo, G. of	5 15	2½		,, Grand P.	0 30	2½	1
Maracas B., Trinidad	3 30	5	4	May, O., U.S.	8 17	5½	4½
Maranham, San Luiz, Brazil.	7 0	16¼	10?	Mayday B., Paláwan	9 55	3½	
Marau Sd., Solomon Is.	10 0	3½		Mayne Hr., Smyth Chan.	1 40	6	
Maravi P., Cuba	7 56	2		Mayo, C. Verde Is.	6 30	5	
Marble I., Hudson B.	4 10	12	9	Mayotta I., Mozambique	4 10	12	
March Hr., Tierra del Fuego.	3 10	6		Mayumba, Africa, W. C.	4 35	7	
Mardunah I., Red S.	6 0	3		Mazatlan, Mexico, W. C.	9 40	7	
Mare Hr., Falkland Is.	6 20	6		Mbau Rd., Fiji Is.	5 45	6	
Margate, England	11 45	15½	13	Mboli Hr., Florida I., Solomon Is.	5 30	6?	
Maria Van Diemen, C., New Zealand.	8 0	7		Mbukalou Cr., Fiji Is.	6 30	4½-5½	3-3¾
				Mchengangazi, Africa, E. C.	3 43	11	7¼

* *See* note, page 204.

R 2

Place.	High water, full and change.	Rise.		Place.	High water, full and change.	Rise.	
		Springs.	Neaps.			Springs.	Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Mchinga B., Africa, E. C.	4 0	12		Millport, Cumbrae I., Scotland.	11 50	10	6
Medway P., Nova Scotia	7 50	8	5				
Meichen Sd., China, E. C.	0 30	17		Min R., W. Brother, China, E. C.	10 32	19½	15½
Mejillones del Sur B., Bolivia.	9 45	4		,, Pagoda Anch., China, E. C.	11 50	17½	14¾
Melbourne, Australia, S. C.	2 48	2¾	2	,, Fuchau	0 40		
MellakoriR.,Africa, W. C.	7 40	11		Minehead, England	6 24	32¼	24½
Mellish Rf.. Sand cay, Australia, E. C.	7 55	5-6		Minerva Rfs., S. Pacific	8 0	6	
Mellon, Ireland	6 1	18¼	13¾	Mingan Hr., G. of St. Lawrence.	1 16	6	4
Memory Rk., Bahamas	7 50	3		,, I., G. of St. Lawrence.	1 30	6	4
Menadou B., C. Breton I.	8 15	5½					
Menai lighthouse, England, W. C.	10 10	22	16¾	Minikoi I., Malabar Coast	11 15?	5	3¼
				Minimegash, P. Edward I.	3 30	5	3
Menam R., Paknam, G. of Siam.	5 7	9½		Miño, R., Portugal	2 30	7	
Mendocino B., California	10 35	4½	3¾	Minow Is., Madagascar, W. C.	5 0	15	10
Menemsha bight, U.S.	7 45	4	2½	Minquiers rocks, France	6 6	35	26
Menschikoff Is., N. Pacific.	4 0	5½		Miquelon Rd., Newfoundland.	8 33	3¼	
Merbat, Arabia, S.E. C.	9 0	7		Miramichi B., G. of St. Lawrence.	4 45	5	1¾
Mercury B., New Zealand.	7 21	7	5				
Mera Koura, Japan	6 1	5¼	3¼	Miraporvos, Bahamas	9 30	3	2¼
Mercy, B. of, Banks land		2		Mirs B., Tide cove, China, E. C.	10 0	6½	
,, P., Magellan Str.	1 22	4		Miscon, G. of St. Lawrence.	2 30	5	3
Mergui, B. of Bengal	10 29	18	11				
Merigomish, Nova Scotia.	10 6	5¼	3¼	Mississippi, S.W. pass, G. of Mexico.		1½?	
Mersa Shab, Red S.	6 0			Mistanoque Hr., Labrador	10 30	6	3
Mersey, R. Tasmania	11 15	9		Mistley quay, Stour R., England.	0 48	11¾?	
Merville, France	9 45	21	17½				
Metalanim, P., Caroline Is.	4 20	3-4½		Misuma Hr., Japan	9 25	18	
				Mitarai pier, Japan	10 10	13½	9
Metensa B., New Hebrides	6 30	4	3¼	Mitford Hr., Banguey I.		7	
Metlah Catlah, America, N.W. C.	noon.	21	17	Mitho Rd., Cochin China	3 50	11	7
Mevagissey, England	5 4	15½	12	Miwara, Japan	10 37	11	8
Mew B., Sunda Str.	6 0	3		Miyadsu Hr., Japan	2 5	1	
Mezen, White S.	2 8	20		Miyako B., Japan	3 35	3¾?	
Mgan Mwamia, Africa	3 45	12		Moala, Fiji Is.	5 50	5	
Miau tau, Depôt B., Yellow S.	10 35	6		Mobile, G. of Mexico	irr.	1-2	
Middle cove, Tierra del Fuego.	3 30			Mocha I., Chile	10 30	3	
				Moerdijk, North S.	4 0	9	
,, I., Patagonia, W. C.	noon.			Mogador, Africa, W. C.	1 18	10-12	
Middlesborough, R. Tees, England.	3 47	17	12¼	Mogdishu	4 30	8	
				Mohaka R., New Zealand	6 40		
Middleton R., bight of Benin.	4 15	5		Mojanga, Madagascar, W. C.	4 45	12½	8¾
,, Rf., S. Pacific	8 30	6		Mokha Rd., Red S.	noon.	4¼	
Midway Is.. N. Pacific	3 28	1½	1	Mole Hr., Alaska	0 54	16	12¼
Mikindani, Hr., Africa, E. C.	3 45	12		Molle, P., Australia, E. C.	11 11	12¼	
				Molokai I., Sandwich Is.	3 15	2½	
Mikuni Rd., Japan	2 0	2		Moltke Hr., S. Georgia	7 20	2½?	
Milford haven, St. Ann's Lt. Ho., England, W. C.	6 6	21¾	16½	Molyneux B., New Zealand.	3 0	8	6
				,, Sd., Patagonia	11 30?	3?	
,, Sd., New Zealand, Middle I.	9 15	8	6	Mombasa, Africa, E. C.	4 0	12	8
				Mona I., W. Indies	6 20	2-4	
				Monach Is., Scotland, W. C.	5 44	12¼	8¼

Place.	High water, full and change.	Rise Springs.	Rise Neaps.
	h. m.	ft.	ft.
Monckton, railway, B. of Fundy.	0 15	47	37½
Mondego bar, Portugal .	2 30	7	
Mono I., Solomon Is.	2 24?	2–3	
Monomoy, United States	0 7	3¾	3½
Monrovia, Africa, W. C. .	6 0	6	
Montagu I., Australia, E. C.	8 30	5–7	
Montaran Is., Carimata Str.	9 40?	6 ?	
Montauk Pt., U.S.. .	8 20	2½	2
Monterey, California .	10 43	4¾	4
Monte Video, S. America, E. C.*	2 30?	1½–5	
Montgomery Is., Australia, W. C.	noon.	36	
Montrose, Scotland .	2 17	14	11
Monts, Pt. de, R. St. Lawrence.	noon.	12	6
Moutt, P., Reloncavi Sd., Chile.	0 48	18–20	14–15
Moramba B., Madagascar, W. C.	3 53	11¾	8¼
Morant, P., Jamaica .		½–1½	
Morecambe, England .	11 26	27	21
Moreno, Constitucion Rd., Bolivia.	10 0	4	
Moresby, P., New Guinea	9 12	9	
Moreton B., entr., Australia, E. C.	9 30	4–7	
,, Head of .	11 0	6	
Morombe C., Madagascar	6 0	12½	8½
Morondava, Madagascar, W. C.	4 36	14?	10¾
Morwellham, R. Tamar, England.	6 12	10½	6½
Morjovets I., White S. .	11 20	17	
Morlaix Rd., France .	4 53	24	18
Morro, Sandy Pt., Ecuador.	5 0	11	
Mosquito inlet, U.S. .	7 44	2¾	1¾
Mossel B., Africa, S. C. .	3 30	6	
Moudiuga I., White S. .	5 50	3½	
Moulmein, B. of Bengal .	3 41	14–15	11–12
Mount Desert I., U.S. .	11 2	10¾	9¼
,, Louis B., R. St. Lawrence.	2 0	6–8	4
Moura B., Japan .	3 57	2¼	1¼
Mourilyan Hr., Australia, N.E. C.	9 0	8–10	5–7
Mouton, P., Nova Scotia	7 54	7½	5
Moville, Ireland .	7 6	7½	5½
Mozambique Hr., Africa, E. C.	4 15	12	
Msimbati Chan., Africa, E. C.	4 0	11	
Mtamahuli, Comoro Is. .		11	
Mto Mtwara, Africa, E. C.	3 45	12	
Mucaras Rf., Bahamas .	7 40	3	

Place.	High water, full and change.	Rise Springs.	Rise Neaps.
	h. m.	ft.	ft.
Mugeres Hr., B. of Honduras.	9 30	1½	
Mul Dwarka, Hindustan, W. C.	10 30	7	
Mull of Cantyre, Scotland.	10 35	4	
Mulroy B., bar, Ireland .	5 40	11¾	8½
Mumbles Lt. Ho., England, W. C.	6 0	27¼	20¼
Mungulho R., Africa	3 45	12	
Murmagao, Hindustan, W. C.	10 33		
Murray Is., Torres Str. .	9 30	10	
† ,, R., bar, Australia, S. C.	0 50	3–4	2–3
,, Sd., Korea .	0 17	10	
Musa, B., Babuyan Is. .		5	
Mutlah R., Biddah R., entr.	10 0	14	
,, R., Ward Chan. (Muda Kali)	9 0	10	
,,	11 45	15	
B. of Bengal.			
Mutton I., Ireland, W. C.	4 20	13¾	9½
Myggenæsfjord, Færöe Is.	9 0	9½	7¼
Na Vatu Rf., S. Pacific .	6 8	4	
Naaf, R., B. of Bengal .	10 0		
Naalsofiord, Færöe Is. .	4 0	6½	4½
Nachvak B., Labrador	7 8	5	3¾
Nadrouga, Fiji Is. .	6 0	5–6	
Nafa Kiang, Liu Kiu Is. .	7 4	7¾	4¾
Nagasaki B., Japan	8 11	10¼	7
Nain, Labrador .	7 9	6½	
Nairai I., Fiji Is. .	5 53	4½	3½
Nairsa I., S. Pacific	4 30	2¾	
Nam Kwan Hr., China, E.C.	10 0	17	
Namo Hr., China, E. C. .	10 0	7½	
Namoa I., Clipper Rd., China, E. C.	11 15	7	
Namu Hr., America, N.W. C.	1 0	15	12½
Namuka, Tonga Is. .	7 15	3½–4¾	
Nanaimo Hr., G. of Georgia, Vancouver I.	5 0	14	
Nauao North Hr., Japan .	2 50	1½	?
Nandi passage and B., S. Pacific.	6 35	½	
Nangamesi Hr., Sumba .	11 30	17	13½
Nangka I., Banka Str. .	7 0	9¾	
Nankaury Hr., Nicobar Is.	9 15	8½	
Nanking, Yangtse-kiang.	1 0?	4 ?	
Nanoose Hr., Vancouver I	5 0	15	

Place.	High water, full and change.	Rise Springs.	Rise Neaps.	Place.	High water, full and change.	Rise Springs.	Rise Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Nantucket, U.S.	0 37	3¼	2¾	New Dungeness, Oregon	3 3	5?	
Napier Hr., New Zealand	6 15	3-4		„ Haven, U.S.	11 16	6¼	5¼
Narbada (Nerbudda R.), Broach Pt., Hindustán, W. C.	3 40	25		„ London, U.S.	9 28	3	2½
Narmaur Is., Caroline Is.	3 0	6		„ Providence, S.W. B., Bahamas.	7 30	4	
Narovo I., Solomon Is.	6 0?	1½-2		„ Quay, England, W.C.	7 30	13	
Narovo Rovo, New Hebrides.	6 0	5?		„ Rochelle, U.S.	11 22	8½	7½
Narraguagus B., U.S.	10 23	12¼		„ R., New Zealand	0 10	8	4
Narrows, First, Magellan Str.	9 0	36-12		„ Ross, Ireland	6 4	12½	10
Narrows, Second, Magellan Str.	10 0	23		„ Year Sd., Tierra del Fuego.	3 30		
Naruto, Fukura, Japan	6 14	6¼	4¼	„ York, U.S.	8 16	4¾	4
Nash Pt., Bristol Chan.	6 25	33	25	Newburyport, U.S.	11 22	8¾	8
Nasparte inlet, Vancouver I.	noon.	12		Newcastle, Australia, E.C.	8 50	4-5½	3-4
Nass B., America, N.W. C.	1 10	23	17?	„ England	3 32	15½	11¾
Nassau, New Providence, Bahamas.	7 30	4	3	„ Ireland	11 4	14¼	12
„ B., Tierra del Fuego.	4 0	6		Newhaven, England	11 14	19	14
Natal, P., Africa, S. C.	4 30	6		Newport, Bristol Chan.	7 10	38	29
Naturaliste Chan., Sharks B., Australia, N.W. C.	11 45	6		„ England, W. C.	7 0	12	9
Nau chau passage, G. of Tongking.	10 20?	12¾??	8?	„ U.S.	7 45	4½	4
Navalo, P., France	3 55	17	13	Newry, P., Australia, E.C.	11 15?	12?	
Navibandar, Hindustán, W. C.	10 17	8	6½	Newton Stewart, Scotland, W. C.	noon.	12	6
Naviuar, G. of Cutch	0 47			Ngaloa B., Fiji Is.	6 38	5¼	4½
Nawanagar, Hindustán, W. C.	1 45	18	14	Ngau I., Fiji Is.	6 7	5	3¾
Naze, The, England	11 50	12½	10	Nhatrang B., CochinChina	8 30	6	
Neath, England	6 16	13½		Nicholson, P., Lambton Hr., New Zealand.	4 17	3¼	3¼
Necah B., Oregon	0 0	7½	5¾	Nicobar I., Nancowry Hr., Indian O.	9 15	8½	
Needles Pt., England	9 46	7½	5	Nicoya G., P. Herradura, Central America.	3 9	10	
Negapatam, B. of Bengal.	9 0	2½		Nieuport, Belgium	0 18	16	13
Negro Hr., Nova Scotia	8 12	7	5¾	Nieuwediep, Netherlands	7 27	4	
„ R., Patagonia	11 0	14	10	Nievre P., Diego Suarez	3 33	6¼	4½
Neira, Banda Is.	2 0?	9-10		Niger R., Nun entr., Africa, W. C.	4 15	5	3½
Nelson, New Zealand	9 50	14	10	Night I., Australia	8 40	7-9	6½
„ B., New Hebrides	6 10	5?		Niigata, Japan	3 10	1½	
„ P., Australia, N.W. C.	noon.	27		Nikolskoi Chan., White S.	5 25	3	
Nemoro Anch., Japan	4 9	5½	3¼	Nimpkish R., Vancouver I.	0 30	14	
Nennortalik, Greenland, S. C.	6 0	8¼		Nimrod Sd., China, E. C.	10 30	20	
Neuf, P., R. St. Lawrence	2 10	14	8½	Nin B., Philippines	11 58	{ 8½ 9½ }	Jan. July
„ R. St. Lawrence	8 30	14	9	Ninepin group, „	10 0	5	
Neuharrlingersiel, Germany.	11 55	5½		Ning hai, Yellow S.	noon.	6	
Neuzen or Terneuse, North S.	1 35	15	11	Ning po fu, Yung R., China, E. C.	1 0	9	
Neville, P., Vancouver I.	0 30	17		Nisi Sima, Inland S.	10 15	6?	
New Bedford, U.S.	7 59	4½	3¾	Nizampatam, B. of Bengal	9 0	4½	3½
New Bedford Castle, U.S.	11 16	6¼	5¼	Noamh I., Scotland	5 2	11½	7
				Noarlunga, P., Australia.	4 0	6	
				Noel B., B. of Fundy	0 41	50½	43½
				Noir I., Tierra del Fuego	2 30	5	
				Noirmoutier, France	3 17	17	13
				Nolloth, P., Africa, W. C.	2 35	5¼	3½
				Nomi Hr., Japan	6 0	7	4½
				Nootka Sd., Vancouver I.	noon.	12	
				Norderney, Germany	11 15	7¾	
				Nore, The, England	0 30	15½	13
				Norfolk I., S. Pacific	7 45	5	

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Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Norman, R., Australia, N.C.	} See page 200.			Observatory, B., inlet, America, N.W.C.	1 5	23	12
Normanby Sd., Torres Str.	irr.	12?	4½	,, I., Palawan	11 0	5¼	
North Balabac Str., China S.	10 50	5		Occasional Hr., Labrador	6 48	5	3½
,, C., C. Breton I.	8 0	4	3	Ocracoke inlet, U.S.	7 4	2¼	2
,, Edisto R., U.S.	7 10	6½	5¾	Octavia B., New Granada	3 30	13	
,, Hr., Newfoundland.	8 0	7½	5	Oderin, Newfoundland	8 6		5
,, haven, New Hanover.	2 30	3		Ofunato Hr., Japan	5 5	4	2¼
,, sands, Malacca Str.	5 30	15	12	Ogden Chan., America, N.W.C.	1 0	20	
,, Shields, England	3 21	14¾	11¾	Oiika Seto, Japan	8 40	10¼	2-4
,, Star B., Greenland, W.C.	11 8	7¼		Okarito lagoon, New Zealand.	11 40	9	
Nosari Khari, bar, Hindustan, W.C.	3 0	18		Okha Pt., G. of Cutch	12 8		
Noshap saki, Yezo	4 8	5¾	3¼	Oki I., Japan	3 16	1½	
Nosi Bé, Madagascar	4 29	14	8¾	Okoyama, Japan	10 15	6	4½
,, Hao, Madagascar	5 0	8½	5¼	Okusiri, Japan	3 30	1½	
,, Lava, Madagascar, W.C.	4 20	11¾	8¼	Old Férolle Hr., Newfoundland.	9 46	5?	
Noss I., Madagascar	5 0	15		,, Point Comfort, U.S.	8 46	3	2½
Notsuke B., Japan	4 50	4½	1½	,, Providence, B. of Honduras.	irr.	1	
Nottingham I., Hudson Str.	9 30	13	9½	Oleni Rd., Lapland	7 30	12	
Noumea B., New Caledonia.	8 25	4		Olga B., G. of Tartary	5 30	3	
Novaia Zemlia Hr., Lapland.	6 36	10		Olympia, Puget Sd.	5 30	14	
Novaia, Zemlia, W.C.		3?		Omeider I., G. of Akabah, Red S.	6 0	4	
Nuchatlitz inlet, Vancouver I.	noon.	12		Omersari R., Hindustan, W.C.	1 45	18	14½
Nuévo, P., Central America.	3 10	12		Ominato P., Japan	4 26	2¾	1?
Nukulau, P., Fiji Is.	6 47	3¼-5¾		Onionville, France	7 29	15¼	12½
Nukualofa, Friendly Is.*	7 0	4¾-5¼	3-4¾	Om Rasas, Masira, Arabia, S.E.C.	10 0	10	
Numa-Choa, Comoro Is.	3 0	14		One fathom bank L. V., Malacca Str.	6 15	14	10
Nunez R., Africa, W.C.	10 0	15	11¾	Onega R., White S.‡	9 12	9½	7½
Nusa Hr., New Ireland	3 34	2?		Ono I., Fiji Is.	6 0	6	4½
Nyminde Gab, Jutland	2 45	2½		Osaka R. entr., Japan	7 30	5¾	4¾
				,, city, Japan	8 17	2¼	¾
				Oosima, Japan	6 50	5	4
				Oösuka, Japan	9 15	8½	5
				Opobo R., Africa, W.C.	4 30	7	5½
				Oporto, Portugal	2 30	10	8
				Opotiki R., New Zealand	7 0	7	
				Opunake B. ,,	9 45	10	7
				Orange B., Tierra del Fuego.	3 36	2?	
				Orford haven bar, England.	11 30	7½	
				,, P., California	11 32	6	4¾
				,, quay, England	0 30	7½	
				Orfordness ,,	11 15	8	6½
Öö fiord, Iceland	9 50			Orignaux Pt., R. St. Lawrence.	3 47	17½	13
Oamaru, New Zealand	3 0	5 to 7		Orinoco R., entr., Guiana	6 0	3	
Oazy Hr., Magellan Str.	10 18	7	6	Orleans I., R.St. Lawrence	5 40	17	13
Oban, Scotland	5 28	13	9½	Orlov Letni, C., White S.	5 18	4	
Obb of Harris, Scotland	6 16	11½	8½	Ormond, Kenmare R., Ireland.	3 43	10	7½
Obokh, G. of Aden†	8 15?	8¼?		Ornsay, I. of Skye	5 50	14¾	10½
Observatory, B., Kerguelen I.	6 0	5¾	2½				

* See note, page 202. † See note, page 188. ‡ See note, page 177.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Os Ilheos, Brazil	4 30			Palmas, C.. Africa, W. C.	4 30	4	
Osaki, Japan	5 55	6½		Palmedo Rd., Sumba I.		15	
Oscuro cove, Patagonia, W. C.	0 55	20		Palmyra I., N. Pacific	5 5	3	
Oscuro cove, Chile	9 0	6½	4½	Paluan B., Mindoro		5	
Osprey Rf., Australia, E. C.	8 36	6		Pamarung Is., Borneo, E. C.	7 0	6-7	
Ossabaw Sd., U.S.	8 19	8	6½	Pamban pass, B. of Bengal.	1 48	3	
Ostende, Belgium	0 25	17	13	Panama Rd., Central America.	3 0	18¾	10½
Otaheite, S. Pacific	noon.	1½		Paubula R., Australia, E.C.	9 0	4-6	
Otéa, Society Is.	irr.	2	1	Pandelemona P., Mediterranean.	3 10		2½
Oterranai, Yezo I.	4-12	1½	½				
Otterswick, Orkneys	9 13	11	8	Pangani R., Africa, E. C.	4 15	15	10
Otway, P., Patagonia, W. C.	11 37	6		Pankol, Palawan	9 40	6	
Ou Ou Kinsh inlet, Vancouver I.	noon.	12		Pansand hole, England	noon.	15½	13
Ouro R., Africa, W. C.	noon.	8-9		Paposo, Chile	9 40	5	
Outer Dowsing Sh., England, E. C.	6 10	15	11	Papudo, P., Chile	9 25?	5	
Ovalau, Fiji Is.	6 0	5	3	Paquet Hr., Newfoundland.	6 49		
Owa Raha I., Solomon Is.	6 10	4-5	2½-3½	Paquica, C., Chile	9 45		
Owasi B., Japan	7 0	5½	3½	Para Anch., Brazil, N. C.	noon.	11	
Oxbaasheia, Svea fiord, Norway.	noon.	8		,, Dentro Chan., Brazil, N. C.	10 51	10	
Oyster B., U.S.	11 7	9¼	8	Paracel Is., China S.	10 30?	3?	
,, inlet, Australia, N.W. C.	10 35	18		Parahiba R., entr., Brazil	5 0	8	5½
Oyestreham, France	9 59	19	15	Paramushir Str., Kuril Is.	6 53	5½	
Ozi Anch., Africa, E. C.	4 8	10¾	6½	Paranagua, Brazil	3 0?	6½	
				Parenga renga Hr., New Zealand.	7 54	7	
				Parida I., New Granada	3 15	10	
				Parsboro, B. of Fundy	0 17	43	37½
				Pasade, C., Ecuador	3 30	10	
				Pasages, P., Spain	3 20	11	9
				Passage or Culebra I., Caribbean S.	9 0	1	
				Patani Rd., G. of Siam	10 0	2½-3	
				Patapsco R., Bodkin Pt., U.S.	5 42	1¼	1
				Paterson inlet, New Zealand.	1 10	8	6
Pachitan B., Java	3 0	7		Patience, C., Saghalin I.		6?	
Packsaddle B., Tierra del Fuego.	3 30	6		Patras, Greece	4 54	2½	1½
Padang, Sumatra, W. C.	6 50	3½		Patrick P., Scotland	11 10	15	12
Padstow, England	5 13	20½	16¼	Patta B., Africa, E. C.	4 30	10	8½
,, B., England	4 40	22	16	Patterson, P., Australia, N. C.	4 0	13-20	6-12
Pagham B., ,,	11 30	16½	12½	Pattesou, P., Vanua Lava I., Banks Is.	6 40	5	
Pago Pago, Navigator Is., S. Pacific.	7 11	3½		Patuxent R., U.S.	1 16	2	1½
Paimpol, France	6 0	31	23½	Pauillac, France	5 20	18½	11½
Paita P., Peru	3 20	6		Pearce Pt., Australia	6 55	20-26	10-18
Pak-Hoi, Tong-King G.	5 10?	14?	11?	Pearl Bk., Sulu S.	6 5	5	
Palais, port le, Belle ile, France.	3 38	16?	12½	Pecket Hr., Magellan Str.	9 30	7	6
Palak Hr., Mindanao	6 5	8	4½	Pedro Bk., Caribbean S.	8 45	1½?	
Palliser, C., New Zealand	6 0	6		Pedro Gonzales, Trapichi I., New Granada.	3 50	16	
Palm Is., Australia, E. C.		8-10					
Palma Canary Is.	0 30?	9?		Peel, I. of Man	11 8	16¼	13

Place.	High water, full and change.	Rise. Springs	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs	Rise. Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Pegasus, P., New Zealand	11 50	8	6	Phillip, P., Australia, entrance S. C.	2 0		
Peh-tang-ho, Yellow S. .	3 0	9	7½				
Pei-ho or Peking R.,entr., G. of Pecheli.**	3 30	10	7½	,, Dromana .	2 19	3	2½
				,, Schnapper Pt.	2 14	2¾	2
,, (Tien-tsin) .	7 0	4½		,, Bellarine jetty	2 21	2½	2
Pelew Is., N. Pacific .		6		,, Henry Pt. .	2 39	3	2½
Pelican lagoon, Kangaroo I., Australia	4 0	4		,, Geelong .	2 30	3½	2½
				,, Williamstown	2 31	2¾	2
Pelorus Sd., New Zealand	9 5	11	7	,, Melbourne	2 48	2¾	
Pellworm, Denmark .	1 50	10		Phœnix Is., S. Pacific .	5 0	4 ?	
Pemba I., Africa, E. C. .	4 15	12	8	Piankatank R.,Cherry Pt., U.S.	10 5	2	¾
Pembroke dockyard, England, W. C.	6 12	22½	17				
				Pichidanque B., Chile .	9 20	5	
Penang, Malacca Str. .	noon.	9	7	Picton, Hr., New Zealand.	8 53	5	3¾
Peñas, C., Tierra del Fuego.	6 42	12					
Pender Hr.,Str. of Georgia, British Columbia.*	6 0	13		Picton Hr., Nova Scotia†	10 0	6	4
				Piedras cay, Cuba . .	8 0	2½	
Peniche, Portugal . .	1 51			Piel Hr., P. of Barrow, England.	11 5	28	21
Penmarch Rocks, France	3 9	11½	10¾				
Pennington R., bight of Benin.	4 15	5		Pigeon B., Yellow S. .	11 45	8	
				Piju B., Lombok I.. .	noon ?	10-12	
Penrhyn I., S. Pacific .	6 0 ?	1½		Pillar, C., Magellan Str..	1 0	4	
Pensacola, G. of Mexico .		1½		Pinas B., New Granada .	3 15	14	
Pentillie, R. Tamar, England.	5 55	13½	9½	Ping Yang inlet, Korea, (Dau chen).	8 14	15½	9
Pentland firth, Stroma, S. side.	9 47	7½	6	,, ,, Chel tau Anch.	9 25	20½	17½
				Pinmill, Orwell R., England.	0 20	12	
,, Swona, E. side	10 24	10	7½				
,, ,, W. side	9 35	10	7	Pinware B, Labrador .	9 10²	4	2¾
,, Great Skerry, E. side	11 4	7¾	6½	Pio Quinto, P., Babuyan Is.	6 0	6	
,, ,, W. side	10 53			Pioneer R., Australia .	11 15	16-18	11-13
Penzance, England . .	4 30	16¼	12½	Piram I., Hindustán,W. C.	3 32	27¼	22¾
Pérak R. Entr., Malacca Str.	3 15	9	5	Piric, P., Spencer G., Australia, S. C.	7 15	8-12	
Percy Is., Australia, E. C.	10 30	16	13	Pisco B., Peru . .	7 0	3-4	
Perez P., Chonos Arch. .	1 12	7½		Pistolet B., Newfoundland.	7 39	3¼	2½
Perim I., Red S. . .	8 0	6¼-7¾	5½-6¼				
Pernambuco, Brazil .	4 45	8	6	Piti Palena, Patagonia, W. C.	0 23	10	
Peros Banhos, Indian O. .	1 30	5					
Perron, C., Sharks B., Australia, W. C.	0 45	5½		Piti R., Hindustán, W. O.	10 5	9	
				Placentia Hr., Newfoundland.	8 30	7	5
Perth, Scotland . .	3 35	9½					
Pertuis de Maumusson, France, W. C.	3 35	13½	10	Plank Pt., Spencer G., Australia, S. C.	6 15	6-8	
Pescadores Is., Makung Hr., China S.	10 30	9½	7	Plata, P., St. Domingo .	7 30	3 ?	
				Playa Maria B., California	9 20 ?	7-9 ?	
Peterhead, Scotland .	0 34	11½	9¼	,, Parida cove, Magellan Str.	1 8		
Petit passage, B. of Fundy.	10 41	22	18				
Petrel B., St. Francis I., Australia, S. C.	noon.	6		Pleasant H., Falkland Is.	5 0	6¼	
				Plettenberg B., Africa,	3 10	6	
Petty Hr., Labrador .	7 12	4½	3½	Plougrescan, France .	5 17	25½	18¾
Petucura Rk., Patagonia .	0 50	16		Ploumanach, France .	5 15	24¼	18½
Philadelphia, U.S. . .	1 22	7	5¾	Plumper cove, Howe Sd., British Columbia.‡	noon.	12	
Philip B., E. side, Magellan Str.	9 30	24		,, Sd., Fane I., Vancouver I.	irr.	12	
Phillip, P., Australia, S. C.	Lonsdale Pt. 9 42	7	5½	Plymouth breakwater, England.	5 37	15½	12

Place.	High water, full and change.	Rise. Springs.	Neaps.
	h. m.	ft.	ft.
Plymouth, Sutton pool .	5 32	15½	11½
,,　　　U.S. . .	11 4	10	8½
,,　　New,　New	9 30	12	9
Zealand.			
Point de Galle, Ceylon .	2 3	2	
Pola, P., Adriatic . .	9 16	3½	
Pollduff, Ireland . .	7 0	4	2½
Pomba B., Africa, E. C. .	4 15	15	11
Pomeroy inlet, Labrador .	6 20	7	4
Pomquet, Nova Scotia .	9 15	4	2½
Ponce P., Puerto Rico .	2 0 ?	2 ?	
Ponga R., Africa, W. C. .	7 30	12	9½
Poolbeg Lt. Ho., Ireland.	11 12	12–14	9–11
Poole, entr., England . {	8 50 }	6½	4½
	0 25 }		
Poolewe, L. Ewe, Scot-	6 39	14½	10½
land.			
Pools Hr., Newfoundland .	7 0	4	3
Poqueldon Hr., Pata-	0 54	18	
gonia, W. C.			
Porbandar, Hindustán,	9 36 ?	8½	6½
W. C.			
Porirua Hr., New Zealand	7 0	8	6
Portage cove, Alaska .	0 29	18½	14½
Port-au-Choix, New-	10 40	7½	
foundland.			
,, au Prince, St. Do-	8 0	1 ?	
mingo.			
,, de Boucherville,	9 30	13	9½
Hudson Str.			
,, en-Bessin, France .	8 57	20	15½
,, Royal, Jamaica .	11 0	1	
,, Sd., U.S. . .	7 32	7½	6½
,, of Spain, Trinidad .	4 30	4	3
Portchester, England .	11 45	13½	10½
Portendik, Africa, W. C. .	10 0	6	
Porthcawl, England, W.C. .	6 8	28½	21½
Porth Dinlleyn, Eng-	8 40	12½	9½
land, W. C.			
Portishead, England, W. C.	7 11	42	31
Portland B., Australia,	0 30	3 ?	
S. C.*			
,, Patagonia .	noon.	4	
,, bill of, England	6 35	9	6½
,, breakwater,	7 1	6¾	4½
England.			
,, inlet, America,	1 30	23–27	15–20
N. W. C.			
,, U.S. . .	11 17	9½	9
Porto Frio, Brazil . .	2 40	4½	
,, Grande, St. Vincent,	6 0	3½	
C. Verde Is.			
,, Praya, St. Jago,	6 0 ?	5	
C. Verde Is.			
,, Santo B., Madeira .	0 50	7	
Portree, I. of Skye . .	6 32	15	10½
Portrieux, France . .	6 0	31	23½
Portsbridge, England † .	11 48	6½	4
Portsmouth dockyard,	11 41	13½	10¾
England.			

Place.	High water, full and change.	Rise. Springs.	Neaps.
	h. m.	ft.	ft.
Portsmouth, U.S. . .	11 23	9¼	8¾
Possession B., Magellan	8 35	36–12	
Str.			
,, C., Torres Str.	9 0	6	
,, I., Torres Str.	1 0	9¼	
Post Office B., Charles I.,	2 10	6	
Galapagos.			
Pottle cove, Labrador .	6 57	6	
Pouèbo P., New Cale-	4 26	4	
donia.			
Poulamento B., Madame	7 50	6	4
I., C. Breton I.			
Poverty B., New Zealand	6 5	6	
Pratas Sh., China S. .	4 0 ?	5	
Preservation inlet, New	11 20	8	4
Zealand.			
Preston, England ‡ . .	11 20	17	10
Prince Frederick Hr., Aus-	noon.	28	
tralia, N.W. C.			
,, Inlets, New Guinea	10 30	14	10
,, Regent R., St.	0 20	24–37	
George basin, Aus-			
tralia, N.W.C.			
,, Rupert B., Do-	1 30 ?	1½	
minica.			
,, of Wales Str.,		3	
Banks land.			
Princes I., bight of	3 58	3	1½
Biafra.			
Prony B., New Caledonia	8 10	2	
Prospect R., Nova Scotia	7 43	7	6
Providence, U.S. . .	8 15	5?	5
,, I., Indian O. .	6 0	8	
Provincetown, U.S. . .	11 22	10	9½
Pubnico, Beach Pt., B.	9 25	12	10
of Fundy.			
Puerto Bueno, Patagonia,	0 24	8	
W. C.			
,, de la Luz, Gran	0 52	10	
Canaria.			
Puget Sd., Nisqually,	6 0	18	15
America, N.W. C.			
Pugwash Hr., Nova	10 30	7	4
Scotia.			
Pujaga B., Mindanoa,	6 0		
E. C.			
Pulaski fort, U.S. . .	7 20	8	7
Pulicat shoals, Coro-	9 25	2¾	
mandel C.			
Pulo Berhala, Sumatra	2 45	7	
Str.			
,, Condore, China S. .	2 30	6½	
,, Laut, Java S. . .	6–7	7?	3–4
,, Panjang, G. of Siam	7 0	2	
,, Tubah, Malacca Str.	noon.	12	
Puluqui I., Chile . .	1 5		
Puna, Ecuador . .	6 0	11	
Punchbowl, Labrador .	6 59	5½	4½
Pungue R. entr., Africa,	4 22	17	
E. C.			

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* *See* note, page 202.　　† *See* note, page 170.　　‡ *See* note, page 171.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Pwlheli, bar, England, W. C.	7 51	14¾	10½	Rambler Chan., Chusan Arch.	9 44	11-14	7-10½
Pwllfanog, England, W. C.	9 30	19	14¼	Rambler I., Hang chu B.	1 27	25-34	
				Ramos R., bight of Benin.	4 20	5	
				Ramree Rd., B. of Bengal,	9 23	11	8
				Ramsey Sd., England, W. C.	6 0	17	
				,, I. of Man .	11 12	20¾	16
				Ramsgate, England .	11 44	15	12
				Ramsö fiord, Norway .	10 58	6-7	
				Random Hd. Hr., Newfoundland.	7 8	3½	2½
Quaco, B. of Fundy .	11 35	30	25	Rangitoto Rd., New Zealand.	8 10	6-8	
Qlawdzect Anch., America, N.W. C.	1 30	17-22	14-17	Rangoon, B. of Bengal, E. C.	4 36	19	14
Quatsino Sd., Vancouver I.	11 0	11		,, R. Elephant Pt.	3 32	19	13
Quebec, R., St. Lawrence	6 49	17½	12	,, China Bakir Lt. Ho.	3 3	16	11
Queen Charlotte Sd. entr., New Zealand	8 50	8	6	Rano I., New Hebrides .	5 9	4¾	4
Queensferry, firth of Forth, Scotland	2 37	18	14	Ranobe P., Madagascar .	8 0	9	
Queenstown, Ireland,	5 1	11¾	9	Raoul or Sunday Is., S. Pacific.	6 0	5	
Quellon, P., Patagonia, W. C.	0 40	14¾		Rapa I., S. Pacific .	0 10	3	
Quicavi bluff, Patagonia, W. C.	0 57	20		Rappahannock, U.S.	3 2	2¾	2
Quicks hole, S. side, U.S.	7 36	4¼	3	Rarotonga, S. Pacific	6 0½	3½ ?	
,, N. side .	7 31	4¼	3½	Ras Asir, Africa, E. C. .	6 15	6	
Quilca R., Peru . .	8 0	6		,, al Khaima, Persian G.	11 45	7	
Quillebœuf, France .	10 6	9¼	7½	,, el Ketef, Tunis	2 33	2¼	
Quilon, Hindustan, W. C.	0 38	2⅞	2¼	,, Gharib, Red S.	11 30	1½	
Quintai Rd., Chile .	9 35	5		,, Hafun, Africa, E. C.	6 15	4	
Quoile quay, Strangford, Ireland.	0 45	11	9¼	,, Ikuaisi, Red S.	5 30	1¾	
				,, Msangi, Africa, E. C.	4 10	14	9
				,, Sharma	9 0	8	
				,, Madraka ⎫ Arabia	9 0	10	
				,, al-Aseida ⎬ S.E.C.	8 30	5½	
				,, al-Hadd ⎭	9 30	9	
				,, Sheballa	10 0	10	
				Rathmullan, Ireland	5 42	12½	9
				Ratnagiri, Hindustan .	10 52	6¼	4½
				Red B., Ceylon, S. C. .	2 20	2¼	
				,, Ireland .	10 31	4	4
				,, Labrador .	8 19	4½	2
				,, I., Durian Str.	5 0	10½	
Rabat, Africa, W. C. .	1 46	9-12		Redbridge, England {	10 42 / 0 57 }	8½	6
Race, C., Newfoundland .	7 0	6½	5	Refuge cove, Bass Str. .	0 5	8	
,, I., Vancouver I. .	3 0½	8		Refugio P., G. of California.	0 25	10¾	7¾
Rachado, C., Malacca Str.	5 30	13		Régneville, France .	6 20	35	26
Radama, P., Madagascar .	4 40	13		Reloncavi inlet, Chile .	0 55	18	
Ragged I., Bahamas .	8 0	3		Rencontre B., Newfoundland.	8 55	6½	4½
Raine I., Australia, E. C.	8 10	10		Rendezvous I., Borneo, S.W.C.		8	
Rajang, R., Borneo .	4 45	13	9	,, Is., Str. of Georgia.	7 0	14	
Rajapur R. entr. .	10 45	6½	4½				
,, town, Hindustan, W. C.	0 20	7					
Rajpuri R. entr., Hindustan, W. C.	10 54	14	8-10				

Place.	High water, full and change.	Rise Springs.	Rise Neaps.
	h. m.	ft.	ft.
Renfrew, R. Clyde, Scotland.	0 50	11	
Rensselaer Hr., Smith Sd.	11 52	10¾	7¾
Repulse Ids., Australia	11 8	18	
Resolution B., Marquesas	2 30	4	
" P., Tanna I.	5 35	3	
Restoration I., Australia	9 10	7–9	6¼
Reunion I., St. Pierre, Indian O.	noon.	3½	
" I., St. Denis	0 22	2¼	
" St. Paul	1 7	4	
Reveley I., Australia, N.W. C.	6 33	15–17	12
Reykjavik, Iceland	5 21	14½	
Rhanone, New Hebrides	6 55	4?	
Rhin, P., Mulgrave Is.	5 0	6¼	
Rhio Str.	9 50	7	5
Ribble Lt. Ho., England	10 51	25½	19
Richibucto R., G. of St. Lawrence.	3 30	4	2½
Richmond, U.S.	4 28	3½	2¾
" I., U.S.	11 30	11	9¼
" B., Prince Edward I.	6 0	3	2
" R., Australia, E. C.	9 0	3½	
Rigoulette, Labrador	7 37	4	3½
Ringdove B., New Hebrides.	6 10	5	3¾
" inlet, Patagonia.	0 40	5¼	
Rio Grande do Sul, Brazil.		1½–2	
" Janeiro, Brazil	3 0	4	3
" Negro, Patagonia, E. C.	11 0	14	10
Riofrio, P., S. America	0 15	6	
Risiri I., Japan		4?	
Ristigouche R., Campbell town, G. of St. Lawrence.	4 0	10	7
Rivadeo, Spain, N. C.	3 0	15	
Riverhead, Newfoundland	7 0	4¼	2¼
Rivière du Loup, R. St. Lawrence.	3 10	16½	10½
Rivoli B., Australia, S. C.	0 33	4	
Robert, P., Africa, W. C.		3¼?	
Robinson P., Australia, N.W. C.	11 15	19	
Rocas, S. Atlantic	5 15	10	
Roche, C., R. St. Lawrence	9 30	6	4
" Hr., Haro Str.	irr.	12	
Rochefort, France	4 0	16¾	13
Rochelle, "	3 31	16¼	11¼
Rockall, N. Atlantic	3 30	12	
Rockhampton, Australia, E. C.	noon.	9–10	6½–8
Rockport, U.S.	10 57	9	8½
Rocky I., G. of Siam	4 0	4	
Rodriguez I., Indian O.	0 30	5	3½

Place.	High water, full and change.	Rise Springs.	Rise Neaps.
	h. m.	ft.	ft.
Roebuck B., Australia, W. C.	11 0	28	18
Rogerstown inlet, Ireland.	11 15	10	8
Rojhi, Hindustan, W. C.	1 40	18	11
Romsdals, Is., Norway	10 45	6	
Rona, South, Lt. Ho., Scotland.	6 20	14½	10½
Roncador, Rf., Solomon Is.	3 30	6?	
Roodewall B., Africa, W. C.	2 30	6¼	
Rook I., Louisiade Arch.	5 0	3?	
Rooper Hr., Korea	4 40	18	13
Rosario B., California	8 44	6½	
Roscoff, France	4 52	23	17
Roseau Rd., Dominica	1 30?	1½	
Rosslare Pt., Ireland	6 30	5	3½
Rota, Spain	1 24	12½	8
Rotterdam, Netherlands	3 45	7	
Rottnest I., Australia, W. C.	7 50	2?	
Rottum, Netherlands	10 0	7½	
Rotumah I., S. Pacific	4 40	7	4¾
Rouen, France	2 28		
Roundabout I., China, E.C.	10 2	13½	8¾
Roundstone, Ireland	4 28	13½	10½
Rovuma B., Africa, E. C.	4 10	12	
Royal Hr., Roatan, B. of Honduras.	7 45	3½	
" I., Bahamas	7 45	3½	
" Rd., Magellan Str.	9 47	8	
Royalist, P., Palawan, E. C.	11 0?	6?	
Royan, France	3 58	16¾	10¾
Rozel, Jersey	6 15	30	21½
Ruapuke I., Foveaux Str., New Zealand.	1 0	8	6
Rugged I., Nova Scotia	7 59	7½	6
Ruggles B., Falkland Is.	7 30	5	
Rumenia Pt., Malay Pen.	10 30	12	9
Runaway, C., New Zealand.	9 13	7	
Run-by-Guess, Labrador	7 5	5¾	
Rupat Str., W. entr., Malacca Str.	5 45	12	
Rupenbandar, Hindustan, W. C.	10 30	10	7
Rush P., Ireland	6 8	5¼	3½
Rutland I., Ireland, W. C.	5 22	11	8
Ryde, England	11 20	13½	10
Rye B., England	11 20	22	17¼
Sabang B., pulo Weh	9 45	7	4¾
Sabine pass, G. of Mexico		1¾	
Sable C., Clam Pt., B. of Fundy.	8 27	8½	6½

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Sable C., Clarke Hr., B. of Fundy.	8 58	11	9
,, I., N. side, Nova Scotia.	7 30	4	
,, I., S. side, Nova Scotia.	6 30	4	
Sables d'Olonne, les, France.	3 37	12¾	9½
Sahong I., Durian Str.		10	
Sacrificios, P., Mexico, W. C.	3 15	6	
Saddle I., East,China,E. C.	11 0	14	
Sado (Yebisu), Japan	3 50	1	
Safety cove, America, N.W.C.	1 0	14	11
Saguenay R., Chicoutimi, R. St. Lawrence.	4 11	12	8
,, R., Tadousac, R. St. Lawrence.	2 45	17	10
Said, P., Mediterranean	10 0?	½-1½	
Saigon, C., St. James	2 30	12½	
,, city, Cochin China.	4 30	12	
Saiki B., Japan	6 20	6½	4½
Saint Andrew B., G. of Mexico.	irr.	1-2	
,, Andrew P., B. of Fundy.	11 32	25	21½
,, Andrew Sd., U.S.	7 41	7¼	6¼
,, Anne B., Cape Breton.	8 34	6	4½
,, Antonio, C., Cuba.		1½	
,, P., Patagonia, E. C.	10 45	18-30	
,, Antonio, Magellan Str.	noon.	7	
,, Antonio R., Africa, E. C.	3 15	13	10
,, Augustine, U.S.	8 10	4¾	3¾
,, B. Madagascar, W. C.	5 50	10½	7¼
,, Barbe, Sumatra, N.E. C.	0 0	6	
,, Barbe B., Newfoundland.	10 0	4	3
,, Domingo, Haiti	irr.	2?	
,, Francis B., Tierra del Fuego.	4 0		
,, Francis C., Africa, S. C.	3 34	5	
,, Francis Hr. bight, Labrador.	6 40	5	3½
,, Geneviève B., Newfoundland.	10 43	6¼	4
,, George Hr., Newfoundland.	9 45	5¼	3½
,, George Sd., G. of Mexico, middle entr.	1 31	1¾	1¼

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Saint George Sd., G. of Mexico, west entr.	irr.	2½-4	
,, George d'Elmina, Africa, W. C.	4 30	6	
,, Germain, France	6 20	34	25
,, Helena B., Africa, W. C.	2 30	6	
,, Helena I., S. Atlantic.	3 11	3	
,, Helena Sd., U.S.	7 8	6½	5½
,, Helier, Jersey	6 29	31½	23
,, Isidro, C., Magellan Str.	1 0	8	
,, Ives, England	4 44	21	15
,, Jago B., Magellan Str.	9 27	20	15
,, Jean de Luz, France.	3 6	13	9¾
,, John, B. of Fundy	11 21	27	23
,, ,, R.,Africa,S.C.	4 8	5½	
,, ,, U.S.	7 43	5¼	5
,, Johns, Newfoundland.	7 30	3¾	3¼
,, Kilda, Hebrides	5 30		
,, Kyrans, Newfoundland.	8 20	7	5
,, Laurent, R. St. Lawrence.	6 20	17½	14½
,, Lawrence B., America, N.W. C.	8 15	1½ ?	
,, Lewis Sd., Labrador.	6 40	3½	1
,, Lorenzo Chan., Mexico, W. C.	8 22	4½	
,, Louis B., St. Domingo.	irr.	2-3	
,, Lucia, West Indies	2 36	2?	
,, Lunaire B., Newfoundland.	7 6	5	2½
,, Malo, France	6 5	36½	25½
,, Margaret's B., Newfoundland.	10 31	5½-6½	
,, Margaret's B., Nova Scotia.	7 47	7¼	6
,, Mark, B. of St. Domingo.	8 0?	1?	
,, Marks, U.S.	1 14	3	2¼
,, Martin, cove, Tierra del Fuego.	3 40	8	
,, Martin de la Arena, Spain, N. C.	3 0	12	
,, Mary, C., Madagascar.	4 30	10-12	
,, Mary, C., Newfoundland.	8 30	7	5
,, Mary Hr., Madagascar.	4 0	5	
,, Mary Hr., Newfoundland.	7 40	7½	5
,, Mary P., I. of Man	11 10	20	16

* *See* note, page 190.

| Place. | High water, full and change. | Rise. | |
		Springs.	Neaps.
	h. m.	ft.	ft.
Saint Mary R., entr.* Australia, E. C.	9 45	9-12¾	7-10
,, Matthew's I., Bering sea.	5 50?	3?	
,, Michael I., Azores	0 30	6	
,, Nazaire, France	3 47	16¾	13
,, Nicholas Hr., R. St. Lawrence.	1 55	12	7¼
,, Nicholas P., Peru	5 15	3	
,, Nicolas B., Magellan Str.	0 50	6	
,, Paul I., Indian O.	11 0	3	
,, ,, G. of St. Lawrence.	8 40	5	3
,, Paul's Hr., Alaska	11 47	12	
,, Paul's I., Pribiloff Is.	5 49	3	
,, Paul de Loando, Africa, W. C.	3 48	4¾	
,, Peter B., Cape Breton I.	7 30	6	4
,, Peter Hr., Prince Edward I.	8 30	4	2½
,, Pierre, Newfoundland.	8 33	6½	4½
,, Pierre I., Borneo	·	4	
,, Roque, C., Brazil	7 14	8-10	
,, Simons Sd., U.S.	7 43	8¼	6¾
,, Thomas Hr., West Indies.	irr.	1	
,, Tudwall Rd., England, W. C.	7 44	14	10¼
,, Valery - en - Caux, France.	10 46	27	21½
,, Valery-sur-Somme, France.	11 48	28½	22
,, Vincent I., West Indies.	3 0	1½	1
,, Vincent, P., New Caledonia.	5 50	4½	
Saintes, Caribbean S.	6 45		
Saipan I., Ladrone Is.	6 45	2½	
Sakai, Nipon, W. C.	2 0	1	?
Sakau, New Hebrides	5 30	5?	
Sakitsu Ura, Japan	8 0	9	
Sakoshi B., Inland S.	10 10	5¾	4¼
Sal, Cape Verde Is.	7 45	5	
Sula-y-Gomez, S. Pacific.	4 0	4?	
Salango I., Ecuador	0 41	12	
Salat Lumut, Str. of Malacca.	6 0	10-12	
Salat Panansing†, Anamba, Is.	10 0	7½	4
Salbet, Hindustán, W. C.	1 48	10¾	7¼
Salcombe, England.	5 41	15	11½
Saldanha B., Africa, W.C.	2 30	5	3½
Saléo R., Whitthall group, Korea.	5 20?	24¼?	
,, R., Roze I.	5 30?	29¾	24½
Salée Kap-kot-i	6 40	21½	11½

| Place. | High water, full and change. | Rise. | |
		Springs.	Neaps.
	h. m.	ft.	ft.
Salem, U.S.	11 13	11	9¼
Salina Cruz B., Mexico, W. C.	4 29	8½	6¼
Salinas R., Brazil	7 30		
,, Anch., Brazil	8 15		
Salmedina rocks, Spain	1 27	12½	8
Salomon Is., Chagos Archipelago.	1 30	5	
Saltash, R. Tamar, England.	5 45	15	11
Salt Cay Anch., Bahamas	8 15	4	3
,, Creek cove, Australia, S. C.	3 30	6	
Saltees, Ireland, S.E. C.	5 40	13	10
Salum R., Africa, W. C.	8 10	6	
Salut Is., Guiana	4 26	6-10	
Samaná B., Haiti	9 30?	3?	
Samanco B., Peru	6 30	2	
Samboanga, Mindanao	6 54	4?	
Same Anch., Japan	4 40	4¾	3¾
San Andres B., Patagonia, W. C.	0 45	5	
,, Antonio, Rio de la Plata.	10 0	5½	
,, Antonio P., Chile	9 43	5	
,, Bartolomé, P., California.	8 50	7-9	
,, Bento R., Africa, W.C.	4 30	4¾	2¼
,, Blas, La Plata	1 30	12	10
,, ,, Mexico, W. C.	9 41	6½	
,, Carlos P., Falkland Is.	7 0	8	
,, Carlos P., Patagonia, W. C.	0 14	6	
,, Diego B., California	9 35	5¼	3¼
,, ,, C., Tierra del Fuego.	4 30	10	
,, Domingo P., Patagonia, W. C.	noon.	7	
,, Estevan, P., Patagonia, W. C.	0 15	5	
,, Fernando, Trinidad.	4 38	5	3
,, Francisco bar, California.	11 39	4¼	3¼
,, Francisco Hr., California.	0 5	5	4
,, Jacinto, P., Philippine Is.	6 30	6	
,, Joao Is., Brazil	6 24	14	
,, José Rd., Central America, W. C.	2 55	9¼	6?
,, Josef, P., Patagonia, E. C.	10 0	30	25
,, Juan, Porto Rico	8 2	1½	
,, ,, Anch., California.	9 40?	5	
,, Juan P., Peru	5 10	3	
,, ,, R., New Grenada.	6 0	12	
,, Juan del Sur, Central America.	3 8?	10?	

* *See* note, page 199.   † *See* note, page 194.

Place.	High water, full and change.	Rise Springs.	Rise Neaps.	Place.	High water, full and change.	Rise Springs.	Rise Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
San Julian, P., Patagonia, E. C.	10 45	30					
,, LorenzoB.,America, W. C.	2 50	12	8	Santa Cruz, Tenerife	1 30	8	6
,, Lucas B., California	8 28	4		,, ,, I., California	9 29	5	3½
,, Luis, G. of Mexico.		1¾	¾	,, ,, I., S. Pacific	4 50	4-5	
,, Luis Obispo, California.	10 17	5	3½	,, ,, R.,Patagonia, E. C.	9 30	40	29
,, Pablo B., California.	1 40	5¼	4¾	,, Elena P.,Patagonia, E. C.	4 0	17	
,, Pedro Hr., California.	9 36	5½	4	,, ,, B., Ecuador	1 18	8	
,, Pedro pass, Patagonia, W. C.	0 30	9		,, Magdalena I., Magellan Str.	noon.	10	
,, Quentin, P., California.	9 19	4		,, Maria I., Chile	10 20	6	
,, Salvador P., Falkland Is.	8 10	8		,, Monica, California.	9 37	5¾	4½
,, Sebastian,Spain,N.C.	3 0	12	9	,, Teresa B., California	11 50	10¼	7½
,, ,, B., Africa, S. C.	3 8	6		,, Tomas	9 0	4	
,, Sebastian B., Patagonia, E. C.	7 0			Santander, Spain	3 30	15	12
,, Sebastiao, Brazil	2 0	4		Santiago de Cuba, Cuba	8 30	2	
,, Tadeo, R., Patagonia, W. C.	11 45	6		,, R., Ecuador	3 30	13	
,, Thomél.,Africa,W.C.	3 25	4½		Santoña, Spain	3 0	12½	10½
Sanboronbon B., S. America, E. C.	10 45	6		Saparua I., Banda S.	1 0	6	
Sand cay, U.S.	8 40	2	1	Sapeh B., Sumbawa	1 0	10	
Sandakan Hr., Borneo, N.E. C.	noon.	6¾	1-4	Sapelo Sd., U.S.	7 33	7¾	6½
Sandalwood B., Fiji Is.	6 0	6?		Sapetiba B., Brazil	2 0	5¼	
Sands Pt., U.S.	11 13	9	7¾	Sarangani Pt., Philippine Is.	7 0	6	
Sandwich P., Malekula I., New Hebrides.	5 20	4¾	3¼	Saráwak R., Moratabas entr.	4 0	9	5½
Sandy C., Australia, E. C.	8 50	6-8		,, (Santubong),	4 0	10	6
,, cove, Nova Scotia	10 47	23	19	,, Saráwak junction	5 0	15-18	9
,, Hook, U.S.	7 43	5	4½	,, (city), Borneo, W. C.	5 20	15-18	9
,, I., Madagascar,W.C.	5 0	15		Sargeaunt passage, British Columbia.	1 0	15½	12
,, Pt. Rd., Magellan Str.	noon.	5	4	Sarmiento Bk., Magellan Str.	8 10	36-42	
Sangir I., Moluccas	5 0	6		Sarn Badrig, England, W. C.	7 30	13	
Sung-kau B., Yellow S.	0 55	7	4½	Sarn-y-bwch Rf., ,,	7 40	14	
Sanguianga, ent., Ecuador.	4 10	9		Sauo B., Formosa	5 50	6	4½
Sangwin R., Africa, W.C.	5 15	4		Saugor I., B. of Bengal	10 4	15¾	12¼
Sanmun B., St. George I., China, E. C.	10 20	15		Saumarez Rf., Australia, E. C.	8 0	6	
Sannuna B., Moluccas		9		Savanilla, New Granada		3?	
Santa Ana, Philippino Is.	noon.	5½		Savannah, city, U.S.	8 14	7¼	6
,, Anna Rfs., Brazil	5 45	13		,, entr., ,,	7 18	7½	6½
,, Barbara Rd., California.	9 37	4¾	3½	Savu Savu B., Fiji Is.	6 0	4½	3¼
,, Catalina I., California.	9 28	5	3½	Sawákin, Red S.*	1 0?	1½	
,, Catharina I.,Brazil	2 45	6	4½	Scales Pt., Blackwater R., England.	noon.	14¾	10
,, Clara I., Ecuador.	4 0	11		Scalloway, Shetland	9 30	5¾	4½
,, Cruz, Cuba	noon.	4		Scapa, Orkneys	9 5	10	7½
,, Cruz (Agadir), Africa, W. C.	0 45	9		Scarborough, England	4 11	15¾	12½
				,, Sh.,Philippine Is.	11 0	5	
				Scarnish, Tiree I., Scotland.	5 31	12	9
				Schiermonnikoog, Netherlands.	9 40	5¾	
				Schooner Retreat, America, N. W. C.	0 30	14	11
				Scilly Is., St. Agnes I.	4 30	16	12
				,, St. Mary I.	4 27	16	12

* See note, page 189.

Place.	High water, full and change.	Rise Springs.	Rise Neaps.	Place.	High water, full and change.	Rise Springs.	Rise Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Scilly Trescow, England	4 22	16¼	12½				
Sea Bear B., Patagonia, E. C.	0 45	20		Sharks B., Denham Sd.	0 5	5	
Seaham, England	3 24	14½	10½	,, Freycinet reach	3 0	5	
Seal cove, Grand Manan, B. of Fundy.	10 54	20	15	,, Freycinet estuary	4 15	3½	
,, I., C. Sable, Manan	9 49	12¾	10¼	,, C. Perron	0 45	5½	
,, Is., Labrador	6 39	5½	4	,, Hamelin pool, Australia, W. C.	5 0	3½	
Seamount B., Ireland	6 44	7¼		Sharpness, Bristol Chan.	7 58 ?	28 ?	15 ?
Seattle, Puget Sd.	4 44	10	8½	Shaweishan I., China, E. C.	11 22	14	7¼
Sebenico, P., Adriatic	6 26	1		Shebba, Mediterranean		1	
Sebu, P., Philippine Is.	noon.	7		Shediac Hr., New Brunswick.	noon.	4 ?	3 ?
Segaar B., New Guinea	6 30	6	4	Sheephaven, Ireland	5 32	11¾	8½
Segoro Wedi B., Java	9 0	8-10		Sheerness, England	0 37	16	13½
Seidis F., Iceland	1 20	9		Sheet Hr., Nova Scotia	8 6	6½	4½
Sein, Chaussée de, France	3 21	17½	12	Shefeen I., Africa, S. C.	4 40	12	
Selangor, Malacca Str.	5 0	15	12	Sheffield I., U.S.	10 58	8½	7½
Seldom-come-by, Newfoundland.	7 13	4½	3	Shelburne, Nova Scotia	8 4	7	5½
Selsea bill, England	11 45	16½	12½	Sheldrake I., G. of St. Lawrence.	6 0	5	3
Sem (Seven) Islands, Lapland.	8 20	12		Sheratib Rf., Red S.	11 0	3	
Semiahmoo B., American, N.W.C.	2 0	12		Sherbro R., Buoy pt.	7 55	10¼	7¾
Senegal R., bar	8 42	6½		,, York I.	8 40	6	4
,, Guet N'dar	8 42	6½		Sheridan, C., Smith Sd.	10 37	2½	
,, St. Louis, Africa, W. C.	10 0	6½		Shiaku, Japan	0 16	9½	6¾
Séoul R., Korea :				Shibayama, Nipon, W. C.	2 35	1½	¾
Po ten nai	7 20	16½ ?		Shimidzu, Japan	6 8	6	3¾
Séoul*	9 30	6½		Shihtau B., Yellow S.	1 30	9	7
Sernia, Hindustan, W. C.	1 0	16	13	Shindini, Comoro Is.		11	
Serrana Bk., Mosquito C.		2		Ship Cove, Newfoundland.	8 36	7¼	5½
Serranilla Bk.,Mosquito C.	irr.	2		,, Hr., Nova Scotia	7 54	6½	4½
Seshan Is., Haug-chu B., China, E. C.	0 0	14		,, New I., Falkland Is.	10 30	8	
Sesoko Byochi, Liu Kiu	7 6	7¼	1?	Shippigan, G. of St. Lawrence.	3 42	5½	3
Sestos B., Africa, W. C.	5 20	4		Shiranai B., Japan	3 59	2½	1½
Setozaki Hr., Japan	10 30	4½	2¾	Shiriya-Saki, Japan	4 15	3	2½
Setubal, Portugal	2 30	11½	7	Shoal I., Australia, N.C.	6 0	18-25	10-15
Seudre, R., entr., France	3 35	13½	10	,, Water B., Australia, E. C.	11 30	19-22	15
Seychelle Arch., Mahé I., Indian O.†	4 15	3½-5	3?	Shoalhaven R., Australia, E. C.	8 30	6-9	
Seymour narrows, British Columbia.	4 0	12		Sholl B., Smyth Chan.	11 45	6	
Seven Islands B., G. of St. Lawrence.	1 40	9	5	Shoreham, England	11 34	18	13¼
Sfax Rd., Tunis	3 47	4½	2½	Shukra, Arabia, S. E. C.	8 0	6	
Sha lui tien banks, west part, Yellow S.	2 50	10	8	Shumagin Is., Alaska	1 18	7½	
Shab Kadun, Arabia, S.E. C.	9 20	10		Shushartic B., Vancouver I.		12	
Shab Bu Saifa, Arabia	9 45	10		Si kiang or West river, China, E. C. :			
Shallow Hr., Falkland Is.	9 30	6		,, Sam shui		5-6	
Shanghai, Yang-tse kiang	1 30	10	7	,, Shao king		3	
Shantung promontory, China.	4 0			,, Wu Chu		1-1½	
Shao - king, Si - kiang, China, E. C.		3		Siak R. entr.,Malacca Str.	8 45	9	5
Sharks B., Naturaliste Chan.	11 45	6		,, off the town		10	
				Siassi I., Sulu S.	5 34	8½	
				Sibuko B., Borneo	6 0	7½	4½
				Sibutu, Sulu S.	6 50	5	
				Sidili R., Malay Pen.	9 44	7	
				Sierra Leone, Africa, W.C.	7 50	12½ ?	

* *See* note, page 197.   † *See* note, page 191.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Sihuatanejo, P., Mexico, W. C.	6 46	4	3
Silam Hr., Borneo, E. C.	6 0	7¼	4
Silloth, England . .	11 40	26	20
Simoda, P., Japan . .	5 20	6	
Simonoseki, Japan . .	8 30	8	6
Simons B., Africa, S. C. .	2 44	5¼	3½
Simpson, P., America, N.W. C.	0 14	17¼	13
,, Patagonia, W. C.		6 ?	
Singapore, New Hr., Malacca Str.*	10 35	8	5
Singaung I., B. of Bengal	9 14	6½	3½
Singora, G. of Siam .	8 30	2–3½ ?	
Singotir Mata, Hindustan, W. C.	5 20	24	
Sinu, Africa, W. C. .	5 0	1	
Sir C. Hardy Is., Australia, E. C.	9 15	10	
,, E. Pellew Is., Australia, N. C.	7 30	7	4
Sir R., entr., Hindustán, W. C.	11 30	11	
,, (Juggi)	1 30	6	
Sisal, G. of Mexico . .		2	
Sitka, America, N.W. C.†	0 6	10	7½
Skaapenfjord, Færöe Is.: Between Hesto and Sando.	5 30	9½	7½
Skagen or the Skaw, Jutland.	5 56	1	
Skerries, Ireland, N. C. .	6 15	5	3
,, ,, E. C.	11 0	13	10
Skidegate inlet, Queen Charlotte Is.	1 0	17	14
Skip ness, Scotland . .	11 50	9	6
Skull, Ireland . .	4 2	9?	7½
Slaughden, Orford, England.	1 0	7½	
Slievebane B., Ireland, W. C.	5 49	10½	⁻7¾
Sligo B., Mullaghmore, Ireland.	5 18	11¾	8½
,, Hr., Ireland.	5 23	11½	8½
Sluissche gat, North S. .	0 50	14¾	10
Slyne Hd., Ireland, W. C.	4 30	13¼	10
Smalls Lt. Ho., St. Georges Chan.	6 0	21	
Smerwick, Ireland . .	3 50	11½	8
Smith Sd., Newfoundland.	7 8	3½	2¼
Smithville, U.S. . .	7 19	6	4¾
Smyth Hr., Tierra del Fuego.	noon.	6½	
Snape bridge, Orford, England.	3 0	6	
Snooks arm, Newfoundland.	7 12	4	3¼
Snowy Chan., Magellan Str.	1 0 ?	4	

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.
Socoa, France . .	3 19	12½	8
Society B., Sulivan B., Yellow S.	0 15	8	
Sofala R., Africa, E. C. .	4 0	19	
Sokotra	7 20	8	
Solitary Is., Australia .	9 15	5	3
Solovets Rd., White S. .	5 55	4 ?	
Sonderho, Fanö, Denmark.	2 22	5½	
Song Ka R., Tong King G.	5 0 ?	6–11	
Sooke inlet, Vancouver I.	2 0	8	
Sosnovaia B., White S. .	2 40	6	
Sosnovets B., White S. .	11 44	18	
Souma B., White S.	6 30	5½	
South Farallon, California	10 37	4½	3½
South Rk., Ireland . .	10 58	13	10¾
Southampton, England .	{ 10 30 / 0 45	} 13	9½
South-west B., New Providence.	7 30	4	
,, Pt., Anticosti	1 55	6	4
,, C., New Zealand	noon.	7	5
Southerness, Scotland .	11 50	27½	19½
Southwold, England .	10 20	6½	4½
Spaniards B., Newfoundland.	7 45	4¾	3
Spear Hr., Labrador .	7 22	4½	3
Spencer B., Africa, W. C.	10 50	5–6	
,, G., Thorny passage, Australia, S. C.	noon.	6–8	
,, ,, Pt. Lowly .	7 0	6–8	
,, ,, P. Augusta ‡	8 30	12	
,, ,, Pt. Riley .	5 45	4¾	
,, ,, Wallaroo .	5 45	4–5	
Spensers Anch., B. of Fundy.	11 42	39	33
Spicers cove, B. of Fundy	11 35	37	30½
Spider I., China, E. C. .	10 0	17	
Spiekeroog, Germany .	11 32	8½	
Spitzbergen, Bell Sd. .	8 56	3¼	
,, Danes Sd. .	0 24	5½	
Spring B., Tasmania .	7 30	4–5	3–3½
Spurn Pt., Humber R., England.	5 26	18¾	15
Square Island Tickle, Labrador.	7 14	4½	3½
Stanley Hr., Falkland Is.	5 40 ?	7	5½
Start Pt., England . .	5 41	15	11½
Staten I., Tierra del Fuego	4 30	8	
Staunton I., Yellow S. .	1 30	8	? 5½
Steamer B., Alaska .	0 20	16¾	12¾
Steilacoom fort, Oregon .	4 46	11	9¼
Stephens, P., Australia, E. C.	8 30	6	4
,, America, N.W. C.	0 30	18	
,, ,, Falkland Is.	7 45	7½	
Stewart, C., Australia, N. C.	7 30	14	8

* See note, page 192. † See note, page 209. ‡ See note, page 202.

S

Place.	High water, full and change.	Rise Springs.	Neaps.	Place.	High water, full and change.	Rise Springs.	Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Stewart Hr., Tierra del Fuego.	2 50	4		Surkenis B., Tunis .	4 3	5½	3½
Stirling, firth of Forth .	3 52	7½	4	Surprise B., Bass Str. .	0 43	3	
Stirrup cays, Bahamas .	7 0	4		Susaki, Japan .	6 10	7	4½
Stockton, England .	4 40	11		Sussex P., Falkland Is. .	8 15	6	
Stonefield, L. Etive, Scotland.	7 3			Sutton pool, England .	5 32	15½	12
Stonehaven, Scotland .	1 10	14	11	,, bridge, England .		20½	
Stonington, U.S. .	9 9	3¼	2¾	Suva Hr., Fijis .	6 30	4½-5¾	3-3¾
Stornoway, Lewis I., Scotland.	6 46	13½	9¼	Suvadiva atoll, Maldives	1 0	4	
Strait I., Andaman Is. .	9 31	7½	5½	Suvaroff Is., S. Pacific .	3 10?	3	
Strangford, Killard Pt., Ireland.	10 53	14	11¾	Sviatoi Nos, Lapland .	9 20	14	
,, quay .	0 31	10½	8¾	Swain Rfs.,Australia, E. C.	8 30?	7?	
,, Hd. of lough, Turley rocks.	0 44	11½	9½	Swallow B., Magellan Str.	1 17	5	
Streaky B., Blanche P., Australia, S. C.	0 5	6		Swan I., Tasmania . .	9 16	7	
Stroma, S. side, Pentland firth.	9 47	9	6½	,, Pt., Australia, W. C.	0 10	26	
Stromness, Orkneys .	9 0	10	7½	,, R., Gage Rd. .	8 50	2¾	
Stuart Chan., Oyster Hr., Vancouver I.	6 0	10		Swanage B., England, S. C. {	8 20 / 0 20	6¼	4½
,, ,, Cowitchin Hr.		10-12		Swansea, Mumbles Lt. Ho., England, W. C.	6 0	27¼	20¼
,, I., Str. of Georgia	6 0	12-14		Swatau, China, E. C. .	3 0?	6-9	
Stuparts B., Hudson Str.	8 11	24	18	Swellies, England, W. C.	10 24	22¾	16
Stykkisholm, Iceland .	5 45	12	6¼	Swift B., Australia, N. C.	noon.	18	
Suadi Is., Arabia, N.E. C.	9 30	10?		Swona, Pentland firth, E. side.	10 24	10	7½
Sual, P., Luzon .		6		,, Pentland firth, W. side.	9 35	10	7
Su-a-u Hr., New Guinea .	9 30?	8¼?		Sydney, Australia, E. C.†	8 38	5¼	4
Subic P. Luzon, W. C. .	irr.	4¾		,, Hr., Cape Breton I.	8 15	5	4
Suez B., Hd. of gulf, Red S.	11 0	7	4	Sylvia cove, Magellan Str.	1 0?	4	
Suloga Hr., Louisiade .	irr.	2-3					
Sulu Rd., Sulu I. .	7 38	3¾		Ta-tsing ho R., Yellow S.	4 10	10½	8
Sumburgh Hd., Shetland.	9 45			Table B., Africa, W. C. .	2 40	5	3½
Sunday or Raoul I., S. Pacific.	6 0	5		,, I., Andaman Is. .	8 45	7½	
,, Hr., British Columbia.	1 0	13		Taboga, New Granada .	4 0	14	
Sunderland, England .	3 22	14½	11	Tabu R., Africa, W. C. .	4 45	3-4	
,, N., ,,	2 30	15	11½	Tabuai I., S. Pacific .		3	
Sungi Asahan, Malacca Str.	3 30	10-12		Tachibana Ura, Japan .	6 15	6¼	4½
,, Rokan, entr., Malacca Str.	5 0	17		Taco, P., Cuba .	8 49	2¾	
Sunmiyani Hr., Beluchistan.	9 0	9?		Tadri R. bar, Hindustán .	10 0	6½	5
Supé B., Peru .	4 50	3		Tago, Nipon, S. C. .	6 0	6½	4
Su-quash Anch., Vancouver I.	0 30	16		Tagula I., Louisiade Arch.	9 25	5½	3
Surabaya Str., Java *	10 30?	4-6		Tahiti, S. Pacific .	noon.	1¼	
,, Jansen Chan. .	10 30?	8¼		Tai-cho ho, Yellow S.	0 15	6	
Surat entr., Hindustán, W. C.	2 45	19	15	Taichai Is., China, E. C.	9 0	14	
,, town, ,,	4 0	19		Tailung Chan., Canton R.	1 30	6½	
Surge narrows, Str. of Georgia.	6 0	12		Taipa Anch., China, E. C.	10 0	7	
				Tai Tai B., China S. .	9 30	5¾	
				Taitam B., China, E. C. .	9 10	8	6
				Ta kau Hr., Formosa .	8 30	3½	1¾
				Taku Hr., Alaska .	0 27	17½	13¼
				Takuma, Japan .	0 7	10½	8
				Takush Hr., British Columbia.	1 0	14	11
Suragao, Str., Philippines	9 30?	6¼	4½	Talcahuano, Chile .	10 5	5¼	3½
Surinam, Guiana . .	6 0	9-10	5-6	Talcan I., Patagonia, W. C.	1 3	15½	
				Ta lien whan B., Yellow, S.‡	10 40	11	7

* *See* note, page 192.   † *See* note, page 199.   ‡ *See* note, page 196.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Ta lu tau, Hwang hai	9 30?	15?		Teignmouth, England	6 0	13	9¼
Tam Sui Hr., Formosa	10 15	7-10		Tellicherri, Hindustán, W. C.	11 3	4½	3¼
Tamar R., Pilot Station	11 10	10	7½	Tenby, England, W. C.	5 38	25½	19½
,, Launceston, Tasmania.	1 0	12½		Tepoca B., G. of California.	1 20	15½	11¼
Tamar P., Magellan Str.	1 40	6		Terceira, Azores	0 32	4½	
Tamatave, Madagascar, E. C.	4 18	8		Teriberskei B., Lapland	7 20	13	
Tambisan I., Borneo	10 52	3½		Teremakau R., New Zealand.	9 55	9	
Tamgas Hr., Alaska	0 8	16¾	12¾	Tern I., Australia, E. C.	10 20	10-13	10
Tampa B., U.S.	11 6	1¾	1½	Ternate, Molucca S.	5 10	4	
Tampico, G. of Mexico	2 30?	2?		Terneuse or Neuzen, North S.	1 35	15	11
Tanabé, Kii Chan., Japan	6 0	6	5½	Terschelling, West, Netherlands.	8 40	6	
Tanera, Summer Is., Scotland.	6 37	14	10½	Te-Toro Pt., Manukau, New Zealand.	10 33		
Tanga B., Africa, E. C.	4 0	12	7	Tetrina, White S.	3 17	7	
Tangbac, Chonos Archo.	11 49	10		Tetuan, Africa, N. C.	2 23	2½	1½
Tangier, Africa, N. C.	1 42	8¼	5	Texel bar, Netherlands	6 0	4¼	3½
Tang Ki, China, E. C.	9 30	17		Thames R. entr., New Zealand.	7 45	11	8½
Tangtang Hr., Madagascar, E. C.	4 30	6		Thank God Hr., Smith Sd.	0 13	5½	3½
Tanjong Api, Borneo		7		Thirsty Sd., Australia, E. C.	10 45	20-22	17
,, Bulus, Malacca Str.	9 30	10½	6-7	,, Sd., S. W. entr., Australia, E. C.	11 50	30	
Tanjong Lebang, Sumatra, E. C.	6 30	8-9		Thomas I., Australia, E. C.	11 5	21	
Tanlee B., N. Caledonia	8 4	4½		Thompson Sd., New Zealand.	11 30	8	6
Tanna, New Hebrides	5 35	3		Thorny pas-age, Spencer G., Australia, S. C.	noon.	6-8	
Tapanuli B., Sumatra	6 0	6		Thorsminde, Jutland	3 34	2	
Tappahannock, U.S.	0 42	2	1½	Thousand Is., Java S.*	10 0	3¼	
Taranaki or New Plymouth, New Zealand.	9 30	12	9	Three Hummock I., E. side, Bass Str.	11 30	8	
Tarawa, Gilbert I., N. Pacific.	4 0	6		,, Kings Is., New Zealand.	8 0	7	
Tarbert, Ireland	4 57	14½	10½	,, Points, C., Africa, W. C.	4 0	4	
Tarifa, Spain	1 46	6	3½	,, Rivers, R. St. Lawrence.	11 30	1	
Tarn Pt., England	11 22	23	18	Throgs Neck, U.S.	11 20	9¼	7¾
Tarpaulin cove, U.S.	8 4	2¾	2	Thursday I., Torres Str.	0 0	10	
Tarrafal B., C. Verd Is.	7 0	5?		Thurso, Scotland	8 28	13¼	9½
,, ,, St. Jago	7 28	5?		Thybo Ron, Jutland	4 9	2	
Tarrytown ,,	9 57	4	3½	Tictoc B., Patagonia	1 45	11	
Taske, Japan	9 44	8½	5	Tienpak Hr., China, E. C.	noon.	8½	
Tatamagouche, Nova Scotia.	10 0	8	5	Tigabu, Borneo	11 38	6½	2-2½
Tateyama B., Japan	5 50	5		Tilly B., Magellan Str.	1 30	6	
Ta Tong B., Korea	6 30	13		Timaru, N. Zealand	3 30	6½	
Tauan I., New Guinea	11 30	12		Timballier B., G. of Mexico.	irr.	2	
Tauranga Hr., New Zealand.	7 10	3	4½	Tinagat, Batu, Borneo, E. C.	6 0	8½	5½
Tau-tsui Hd., Yellow S.	3 20	12½		Tinghai, Chusan, China, E. C.	10 25	13	8¾
Tavoy R., entr., B. of Bengal.	10 26	15½	10½	Tioman I., Malay Pen.	6 0	7	8
,, town	noon.	12?		Tiwan I., New Guinea	11 30	12	
Tay R., bar, Scotland	2 6	16	13½	Tobago, Caribbean S.	3 0	4	2
Teavarua Hr., Raiatea I., S. Pacific.	irr.	1					
Tebeyu I., Palawan	10 15	6					
Tebunkus Rd., Baly, N.C.	5 0	6½					
Teelin I., Ireland	5 16	11¾	8½				
Tees R., bar, England	3 45	15	12¼				
Te Kaha Pt., N. Zealand	6 30	9					

* See note, page 192.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Tobermory, I. of Mull .	5 36	13	9½	Tringano R., G. of Siam .	8 0	7	
Tobo Ali Pt., Banka Str. {	8 30† / 10 0	10-12		Trinidad (P. of Spain) .	4 30	4	3
Tobootchi B., Saghalin I.	4 16	3		,, B., California .	11 27	5¾	4½
Todos Santos B., California.	9 28	5		Trinity B., Bull I., Newfoundland.	7 22	3½	2
Tolten R., Chile . .	10 28	5		,, Hr., Newfoundland.	7 10	4	2
Tom B., Patagonia . .	noon.	4		,, Opening, Great Barrier Rfs.	9 15	7-12	
Tomari B., Kuril Is. .	4 9	5¾	3½	Trinkitat, Red S. . . { noon, Feb.		1½	
Tomo Tsu, Inland S. .	11 37	13¾	9	Tripoli, Syria, Mediterranean.	10 20	2	
Tongass narrows, Alaska	0 24	19¼	14½	Tristan da Cunha, S. Atlantic.	noon.	4-6	
Tong - hwang, China, E. C.	9 30	19	14½	Triton B., New Guinea .	1 8	7	
Tongoi, P., Chile . .	9 10	5		,, Bk., Magellan Str.	9 0	15	
Tongsang Hr., China .	11 30	12		Tromsö, Norway . .	1 14	8	
Tongsiau, Formosa . .	10 0	8-10		Trondhjem B., Norway .	11 12	8-9	
Tönning, Germany . .	1 55	11½		Troon, Scotland . .	11 50	10	7½
Tonyon P., Korea . .	8 34	7¾		Troubridge shoals, Australia, S. C.	4 18	7	4-6
Toorbul Pt., Australia .	9 45	6-8		Troy Town Hr., Newfoundland.	7 5	4½	3
Topaze Hr., British Columbia.	3 0	16	11½	Truro, England . .	5 5	10	6
Topocalma Rd., Chile .	9 55	6	4	Trwyn Du, England .	10 28	22	16¾
Tor, Red S. . . .	6 0	1¼		Tsau-liang-hai or Chosan Hr., Korea.	7 45	7	5
Torbay, England . .	6 0	13½	10	Tsing-hai B., Yellow S. .	3 0	9	7
Toro Pt., Chile . .	9 45			Tsuiyama, Nipon, W. C.	2 35	1½	¾
Tortola, Virgin Is. . .	8 30	1½		Tsukumo Hr., Japan .	2 37	1½	⅓
Tortugas, Florida, U.S. .	9 44	1½	1	Tsu-sima Sd., Korea Str.	8 30	8	6
Tory Chan., New Zealand.	8 15	6-8		Tsuruga, Japan . .	0 35	1	
Totoya I., Fiji Is. . .	6 37	4½		Tubuai I., S. Pacific .		3	
Toulinguet Hr., Newfoundland.	7 8	4	3¼	Tudri R. bar, Hindustán, W. C.	10 0	6½	5½
Tourane B., Cochin China	9 30	4		Tuesday B., Magellan Str.	1 0	6	
Tova or Na Vatu Rf., S. Pacific.	6 8	4		Tumaco Rd., Ecuador .	2 33	12	
,, I., Patagonia, E. C.	3 45	18		Tuman B., Chile . .	9 55	6	4
Towan (New Quay), England, W. C.	4 42	21½	15¾	Tumbo I., Africa, E. C. .	6 38	14	7
Townshend Hr., Tierra del Fuego.	2 30	5		Tuna, G. of Cutch . .	1 50	16	13
,, P., Oregon .	3 49	5½	5	Tunghi B., Africa, E. C.	4 5	14	9
Tracadie, Prince Edward I.	7 0	3½	2	Tuni ang I., China, E. C.	9 0	5½	
Tracey Hr., British Columbia.	noon.	16	11½	Tunis, Mediterranean .		3	
Tracy I., Korea, S. C. .	8 58	11½	8¼	Turks Is., Bahamas .	7 40	3	
Træn Is., Norway . .	11 45	7		Turna B., White S. .	9 54	11	
Trangjisvaag, Færoe Ids.	6 2	4		Turnabout I., China .	10 2	13	8¾
Trawbreaga lough, Ireland.	6 10	11½	8½	Turner, C., Prince Edward I.	6 10	4	2
Tréguier, France . .	5 32	23	18½	Turtle I., North, Australia, W. C.	11 0	18	6
Trek I., White S. . .	10 48	20		,, I., S. Pacific .	6 11	4	
Trepassey, Newfoundland.	7 0	6½	5	,, ,, -Backed I., Torres Str.	0 15	10	
Tréport, France . .	11 12	28½	22	Tuskar, Ireland . .	5 45	9	
Tres Cruces Pt., Patagonia, W. C.	1 15	16		Tuticorin Hr., G. of Manár.	1 28	3¼	1¾
Triangles, G. of Mexico .		1½		Tutoia Anch., Brazil .	5 13	12¾	
Trieste, Adriatic . .	9 35	2		Tutukaka Hr., New Zealand.	7 0	9	7
Trincomali Hr., Ceylon .	9 23	2	1½				

† *See* note, page 192.

Place.	High water, full and change.	Rise. Springs.	Neaps.	Place.	High water, full and change.	Rise. Springs.	Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Tweed R., Danger Pt., Australia, E. C.	9 30	6	4½	Utria, New Granada	4 0	12	
Twofold B., Australia, E. C.	8 15	5-7		Uvita B., Cent. America, W. C.	2 19	4?	
Tynemouth bar, England	3 18	15¼	10¾	Uwajima, Japan	7 32	6½	3?
Tyssen I., Falkland Is.	8 0	6					
				Vaagofjord, Færoe Ids.	6 0	9½	7½
				Værö, Norway	noon.	9	7½
Ubian I., Sulu S.*	6 15	5		Vadsö	6 30	6-8	
Uea I., S. Pacific	6 40	6?		Valanga B., Fiji Is.	5 55	5¾	4
Ugi I. "	5 30	4¼		Valdivia P., Chile	11 35	4	
Uinne, New Caledonia	6 48	4		Valentia Hr., Ireland	3 42	11	8
Uist North, Kallin, Scotland, W. C.	5 59	13¼	9½	Vallay, North Uist, Scotland, W. C.	6 10	11¼	8½
" " Vallay "	6 10	11¼	8½	Vallenar, R., Patagonia, W. C.	0 18	5	
" South, L. Boisdale, Scotland, W. C.	5 47	12¼	9½	Valparaiso, Chile	9 32	5	
Ular, C., Banka Str.	6 30	12		Vansittart Saddle, Yellow S.	4 20	10	8½
Ulladulla Hr., Australia, E. C.	8 30	6		Vapna fiord, Iceland	12 0	5	
Ullapool, L. Broom, Scotland.	6 40	14½	10½	Vatoa or Turtle I., S. Pacific.	6 11	4	
Ulugan B., Palawan	9 30	5½		Vatomandri, Madagascar, E. C.	4 20	7¾	
Umm-an-Nakhailah, Persian D.	7 30?	8?		Vavau, S. Pacific	6 20	5	
Underwood, P., New Zealand.	6 10	8	6	Veere gat, Netherlands	1 0	15	11
Ungava B., Kóksoak R., entr., Hudson Str.	8 52	38½		Vengurla, Hindustan, W. C.	11 13	6¾	5½
Union B., La Plata.	3 10	12	9	Venison Tickle, Labrador.	6 47	5½	4
" city, Washington Tery.	4 34	12?		Ventry, Ireland	3 44	10½	7½
" P. la, G. of Fonseca, Central America	3 15	10¾	8¾	Venus, B., Australia, S. C.	11 56	7	
" wharf, Baynes Sd.	6 30	13		" Hr. "	1 30	4-5	
Unsang, Borneo	8 0	3½		Vera Cruz, G. of Mexico		2-4	
Unteng, Liu Kiu Is.	7 6	7¼	4½	Verawal Rd., Hindustan, W. C.	10 27	9	7½
Upernivik, Greenland	11 0	8		Vermilion B., G. of Mexico	irr.	2½	1½
Upstart B., Australia, E. C.	9 6	6-10	5	Vernon Chan., Chusan Arch., China, E. C.	9 40	14	
Urado Hr., Japan	6 43	6½	4½	Vesava, Hindustan, W. C.	11 42	14	8½
Uraga, Japan	5 35	5¼	3¼	Verte B., Nova Scotia	10 0	9	5
Urakani, Japan	7 30	6	4	Vestmanhavn, Færoe Is.	8 0	9½	7½
Urie firth, Shetlands	9 45	6½	5	Victor Hr., Australia, S. C.	1 9	4 to 6	
Urmston Rd., Canton R.	10 30	7		Victoria lock, Newry R., Ireland.	11 43	13¼	10¾
Ursula I., Palawan	11 0	7½		" P., Brazil	3 0	4	
Urup I., Kuril Is.	3 22	4½	3¼	" P., Australia, S. C.	2 40	5	
Usborne, P., Australia, W. C.	1 45	3¾		" St. Juan de Fuca Str.	irr.	7-10	5-8
Ushant, France	3 46	19¼	13¾	" R., Holdfast reach, Australia, N. W. C.	9 0	16	10
Ushibuka Hr., Japan	8 20	8½	7				
Ushuwaia, Tierra del Fuego.	3 58	7					

* *See* note, page 194.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Victoria Mosquito flat, Australia, N.W. C.	0 19	7-13		Wapitagun Hr., G. of St. Lawrence.	10 30	5	3
,, Sandy I., Australia, N.W. C.	1 17	3-10		Waratah B., Australia, S. C.	noon.	8	
,, R., Turtle Pt., Australia, N.W. C.	7 15	15-24		Ward Hunt Str., New Guinea.	5 0	2½?	
Victory pass, Smyth Chan.	1 25	6		Warleigh quay, R. Tavy, England.	5 47	14½	10¼
Vigo, Spain	3 0	12-13		Warnbro' Sd., Australia, W. C.	9 0	2?	1½
Virgins, C., Magellan Str.	8 30	36-42		Warren Pt., Carlingford, Ireland.	11 10	14½	12
Vivero, Spain, N. C.	3 0	15		,, Pt., lough Foyle, Ireland.	6 20	6¼	5
Vizagapatam, B. of Bengal.	8 26	5¼	3½	Warsheik Rd., Africa, E. C.	4 30	8	
Viziadrug, Hindustán, W. C.	10 16	6¾	4??	Washington, U.S.	7 43	2-3	
Volta R., entr.,* Africa, W. C.	4 20	4?		,, Str., Korea, S.W. C.	10 38	8	
Voronov, C., White S.	11 20	17		Watch Hill, U.S.	9 0	3	2¾
Vromo passage, G. of Volo.	9 30	2½	1¾	Waterford, Ireland	6 6	13½	10¾
Vulavu, Isabel I., Solomon Is.	4 0?	4-5		,, Duncannon fort	5 20	12½	10
				Waterhouse I., Tasmania	10 16	8	
				Waterloo B., Africa, S. C.	4 0	6	
				Wax cay, W. Indies	7 45	4½	
				Weary B., Australia, E. C.	9 15	7-10	
				Webeck, Labrador	6 21	7	4
				Webling Pt., Spencer G., Australia, S. C.	6 10	6-9	
				Week Is., Tierra del Fuego	2 0	5	
				Wei-hai or Kyau-chau B., Yellow S.	5 0	12	9
Waddington Hr., Bute inlet, British Columbia	6 0	13		,, wei Hr., Yellow S.	9 30	9	
Wahai Hr., Ceram, N. C.	6 0?	3-4?		Weir Head, R. Tamar, England.	6 17	5½	1¼
Waikato R., New Zealand	9 30	12	9	Welcome B., Patagonia, W. C.	0 50	7½	
Waikawa Hr. ,,	2 30	9	7	,, Hr., America, N.W. C.	noon.	15-16	12-13
Waikokopu ,,	6 30			Weld P., Malacca str.	2 28	8	6
Wairoa R. ,,	6 45	7	4	Weld Pt., Australia, N.W. C.	noon?	10-12	
Wajima, Nipon, W. C.	1 41	1	½	Wellesley Is., Australia, N. C.	8 0	9	
Wakaya I., Figi Is.	6 0	4	3	Wellfleet, U.S.	11 5	13½	12
Wakefield, P., Australia, S. C.	4 40	11	5-6	Wellington, New Zealand	4 17	3½	3¼
Walcott, P., Australia, N.W. C.	11 43	18		Wells, England	7 0	12	
Walfisch B., Africa, W.C.	3 20	5½	3¾	,, bar, England	6 20	18	
Walker Cr., Choiseul I., Falkland Is.	6 20	5½		Wen chau R., entr., China, E. C.	9 53?	22?	15
,, R., Tyne, England	3 26	15¾	11½	Wen chau R., Snipe I.	10 15?	22½?	17
Wallace Hr., Nova Scotia	10 30	8	5	Wenman Is., Galapagos	2 10		
Wallis I., Torres Str.	irr.	7		Weser entr., Germany	11 30	14	
Walton B., England	7 3	39¾	30	,, L. V. ,,	0 20	9¾	
Wang-kia B., Yellow S.	2 30	9	7	West cove, Kenmare R., Ireland.	3 52	10	7½
,, -kia-tai B. ,,	6 0	12	9	,, -kappelle, North S.	0 40	14¾	11
Wanganui R., N. Zealand	10 15	6-8	6	,, Quoddy, B. of Fundy	11 12	21	17
,, inlet ,,	9 20	7	6	,, Volcan I., China, E. C.	0 19	12	8½
Wangeroog, Germany	11 37	8½					
Wang-mun Chan., Canton R., China.	11 50	6½	5½				
Waokan banks, Formosa	10 0	10	5				

* *See* note, page 178.

Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.	Place.	High water, full and change.	Rise. Springs.	Rise. Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Western, P., Australia, Mussel Rk.	0 12	8½	6½	Wolstenholm Sd., Arctic regions.	11 8	7½	
,, Bourchier Chan.	1 13	10¾	8¾	Woodbridge or Bawdsey haven, bar, England.	11 45	11	8
,, French I.	1 0	10	8	,, Kingston quay	0 35	10	
Westmanoerne, Iceland	4 50	11		,, Wilford bridge	0 55	7	
Westness, Orkneys	9 11	10	7½	Woodlark I., Louisiade Arch.	7 15	4	
Weston - super - mare, England.	6 54	37	28½	Woods B., Magellan Str.	0 34	8	
Westport, Ireland	4 57	12¾	9½	,, holl, U.S., entr. from Vineyard Sd.	7 42	1¾	1½
,, bar, N. Zealand.	10 20	9½	5½	,, hole, entr. from Buzzard B.	7 59	4¾	4
Wexford, Ireland	7 21	5	3½	Woody I., Great Sandy Str., Australia, E. C.	9 14	10	7
,, South B., Ireland	5 40	6	4	,, Is., Newfoundland	8 9	7	4½
Whaingaroa Hr., New Zealand.	9 50	12		Woolwich, England	1 37	18½	15½
Whale cay, Bahamas	8 0	4½		Workington, England	11 4	25¾	20
,, Fish Is., Greenland, W. C.	8 15	7½		Worms Hd., England	6 1	25½	18½
Whampoa (In March docks, April China* May & June	1 40 / 1 15 / 0 30	}7-8		Wotje or Romanzoff Is., Marshall Is.	2 30	7	
Whangarei, New Zealand	7 0	9	7	Wrabness, Stour R., England.	0 29	12	
Whangaroa, New Zealand	8 15	7		Wrangell Hr., Alaska	0 30	17½	13½
Whangaruru, New Zealand.	7 10	9	7	Wrath, C., Scotland	7 30	15½	
Whitby, England	3 45	15	11½	Wreck B., Loyalty Is.	6 30	5-6	
White Dog Is., China, E. C.	10 22	20½	16	,, Rf., Bird Islet, Australia, E. C.	8 3	6	
Whitehaven, England	11 14	26	19	Wuchu, Si Kiang R. China, E. C.		1-1½	
,, Nova Scotia	8 0	6½	4½	Wusimado, Japan	10 15	6	4½
Whitsunday Is., Australia, E. C.	10 17	6-10		Wusung R., entr., China†	0 40	12-15	7¾
Wick, Scotland	11 22	10	7½	Wyk, Föhr I., Denmark	1 50	8	
Wicklow, Ireland	10 29	9	6½	Wyndham, Australia, N. W. C.	8 15	23	
Wide B., Australia, E. C.	8 30	6		Wynkoops B., Java	5 0	5½	4
,, Patagonia, W. C.	0 15	4?					
Widewall, Orkneys	9 3	10	7½				
Wigton, Scotland	11 30						
Wilberforce, C., Australia, N. C.	8 10	10					
Wilhelmshaven, Germany	0 52	11¼					
Willemsoord Rd., Netherlands.	7 25	4½	3¾				
Willemstad, North S.	3 30	10					
William, P., Falkland Is.	5 30	7	5½				
,, New Zealand	0 45	8	6				
,, Scotland, W. C.	11 10	18	14				
Willis Is., Australia, E. C.	8 0	6		Xagua, P., Cuba	4 57	2	
Willoughby, C., Kangaroo I., Australia.	4 10	6					
Wilmington, U.S.	9 6	3	2¼				
Willunga, P., Australia, S. C.	4 0	6					
Winter Hr., Melville I.	1 30						
,, U.S.	10 52	11¾	10½				
Winterton ness, England	8 25	7¾	6½				
Winyah B., U.S.	7 43	4	3				
Wisbeach, England	7 30	15¼		Yafa, Mediterranean	10 0	1½	
Wivenhoe, Colne R., England.	0 10	15	10	Yakutat B., Alaska	0 30	9	

Place.	High water, full and change.	Rise.		Place.	High water, full and change.	Rise.	
		Springs.	Neaps.			Springs.	Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
Yama Gawa Hr., Japan .	7 32	9½		York Rd., Magellan Str. .	2 0	9	
Yamada Hr., Japan .	4 30	4		Youghal, Ireland . .	5 14	12¾	10
Yang ho, Yellow S. .	0 15	6		Ythan R., Scotland .		9½	
,, - tse - kiang, Tung-Sha L. V., China, E. C.	11 36	14	11	Yuge Sima, Japan . .	11 25	11½	6¾
Yankalilla, Australia .	3 30	6		Yu lin kan B., China S..	9 5	2¼	
Yap I., Caroline Is. .	7 15	4½ ?		Yung R., Chinhae . .	11 20	12½	
Yaqueña R., bar, Oregon.	11 50	7¼	5¾	,, Ning - po - fu, China, E. C.	1 0	9	
Yarmouth, I. of Wight .	{ 10 0 noon. }	7	5½	,, -hing B., Korea .	5 20	2½	
,, haven (Brush), England.		6	4½	Yura Hr., Japan . .	6 5	6¼	
,, B. of Fundy .	10 9	16	13	,, -no-uchi, Japan .	6 0	5½	4½
,, bridge, England		5	4				
,, Rd., England.	9 15	6	4½				
Yates, P., Chonos Archo.	0 35	10					
Yawatahama P., Japan .	7 25	7¾	5				
Yé R., Burma, Stag I. .	0 13	18	12½				
,, entrance .	0 18	15	9				
,, ,, Yé .	1 8	13½	6½				
Yealm R., Bigbury B., England.	5 37	16¼	11½				
Yellaboi Sd., Africa	7 10	10		Zafarana Lt. Ho., Red S.	11 0	5½	
Yengen, New Caledonia .	6 15	4½		Zambezi R., entr., Africa, E. C.	4 30	12–15	
Yeno Ura, Nipon, S. C. .	6 8	6	3¾	Zand B., Java . .	5 0	4¾	
Yesashi, Japan .		3¼		Zanzibar. . .	4 15	15	10
Yeu, ile d', France .	3 28	14¼	10¾	,, Chan., Africa, E. C.	4 20	15	10
Ylo Rd., Peru .	8 15	6		Zarembo I., N. America, N.W. C.	·0 35	14 ?	
Ymuiden Hr., Holland *.	3 0	5¾		Zarzis, Tunis . .	3 13	2¼	1½
Yobuko, Japan .	9 16	9	6½	Zaudzi, Mayotta, Comoro Is.	4 10	12	
Yokka ichi, Japan, S. C.	6 30 ?	7		Zeila, G. of Eden . .	7 45	8–9½	5¾–8
Yokohama, Japan + .	5 45	5	3¾	Zierikzee, Netherlands .	2 0	10½	9
Yokoska Hr., Japan .	5 15	8	4				
Yonodzu P., Japan .	6 8	6	4¾				
York factory, Hudson B.	11 15	10–14					
,, R., Moodys wharf, U.S.	9 35	3½					

* *See* note, page 176. † *See* note, page 197.

LIST OF SAILING DIRECTIONS, &c., PUBLISHED BY THE HYDROGRAPHIC DEPARTMENT OF THE ADMIRALTY, JUNE 1898.

Title.	Price.

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——————— Supplement, 1898. (*In Progress.*)		
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Hydrographic Notice, No. 1 of 1898		
———————— 4. Shores of the North sea, from Calais to the Skaw, 5th edition, 1892 ...	3	6
———————— Supplement, 1896	1	0
Sailing directions for the West coast of Scotland, Cape Wrath to Mull of Galloway, including the Hebrides or Western islands, 4th edition, 1894	4	0
Hydrographic Notice, No. 3 of 1897	0	2
Sailing directions for the West coast of England, from Scilly islands to the Mull of Galloway, also the Isle of Man, 4th edition, 1891	6	0
Hydrographic Notice, No. 3 of 1895	0	6
Irish Coast Pilot, 1893	3	6
Hydrographic Notice, No. 4 of 1897	0	8
Supplement, 1898. (*In Progress.*)		
NORTH OF EUROPE AND BALTIC SEAS.		
Norway Pilot, part 1. The Naze to Christiania ; thence to the Kattegat, 3rd edition, 1897	4	0
———————— 2. From the Naze to North cape, thence to Jacob river, 2nd edition, 1894 ...	5	6
———————— Supplement, 1897	0	8
Arctic Pilot, vol. 1, comprising the north coast of Russia from the Jacob river to the Tenisei, including the White Sea and Novaya Zemlya (formerly the White Sea Pilot), 1898. (*In the Press.*)		
Baltic Pilot, part 1, containing directions for the Kattegat, the Sound, Belts, and channels to the Baltic, 3rd edition, 1895	5	6

Title.	*Price.*	

Title.	*Price.*

NORTH AMERICA AND WEST INDIES—*cont.*   *s. d.*

St. Lawrence Pilot, vol. 1. Containing sailing directions for the gulf and river St. Lawrence, 6th edition, 1894   3   6

————————————2. Containing sailing directions for the southern parts of the gulf of St. Lawrence, and for its South entrance through Chedabucto bay and the gut of Canso, 6th edition, 1895   ...   3   6

Sailing directions for the East coast of the United States of America, 1st edition, 1899. (*In Progress.*)

West India Pilot, vol. 1. From cape Orange in Brazil to cape Sable in Florida, with the adjacent islands, 5th edition, 1893   3   0

    Hydrographic Notice, No. 2 of 1896   1   0

————————————2. The Caribbean sea, from Barbados to Cuba, with Florida strait, Bahama, and Bermuda islands, 5th edition, 1899. (*In Progress.*) ...   .

SOUTH AMERICA AND PACIFIC OCEAN.

South America Pilot, part 1. East coast of South America, from cape St. Roque to cape Virgins, with the Falkland, South Georgia, Sandwich, and South Shetland islands; also the north coast from cape St. Roque to cape Orange in French Guiana, 4th edition, 1893   4   0

    Supplement, 1896   0   6

————————————2. Comprising Magellan strait, Tierra del Fuego, and West coast of South America from cape Virgins to Panama bay, also the Galápagos islands, 9th edition, 1895...   ...   7   6

    Supplement, 1898. (*In Progress.*)

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    Hydrographic Notice, No. 4 of 1894   0   2

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West coast of Hindustan Pilot, including the gulf of Manar, the Maldive and Lakadive islands, 4th edition, 1898. (*In Progress.*)

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